

EXHIBIT 107

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF OHIO
EASTERN DIVISION

IN RE NATIONAL PRESCRIPTION
OPIATE LITIGATION

This document relates to:

*County of Summit, Ohio, et al. v. Purdue Pharma
L.P., et al.*

Case No. 1:18-op-45090

*The County of Cuyahoga v. Purdue Pharma L.P., et
al.*, Case No. 17-op-45004

MDL NO. 2804

Case No. 17-md-2804

Hon. Dan Aaron Polster

**DECLARATION OF DR. JEFFREY B. LIEBMAN IN SUPPORT OF MOTION OF
PLAINTIFFS COUNTIES OF CUYAHOGA AND SUMMIT, OHIO, FOR PARTIAL
SUMMARY ADJUDICATION REGARDING PLAINTIFFS' EQUITABLE CLAIMS FOR
ABATEMENT OF AN ABSOLUTE PUBLIC NUISANCE**

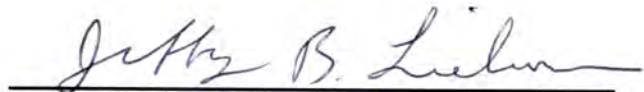
Pursuant to 28 U.S.C. § 1746, I hereby declare as follows:

1. A true and accurate copy of the supplemental report of my opinions in this matter and that I understand was produced to the Defendants on or about April 3, 2019, is attached hereto as Exhibit A.

2. If called to testify at trial, I would testify consistent with the opinions and other matters set forth in my supplemental report attached as Exhibit A.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 25, 2019



Dr. Jeffrey B. Liebman

Exhibit A

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SUPPLEMENTAL EXPERT REPORT OF DR. JEFFREY B. LIEBMAN

April 3, 2019

I. EXECUTIVE SUMMARY

1. The communities of Cuyahoga County and Summit County, Ohio (the “Communities”) are in the midst of a public health emergency due to the growth in the use of prescription opioids and the harms resulting from such use.¹ Thousands of residents have died; hundreds of infants have suffered the ill effects of neonatal abstinence syndrome; families have been separated due to the struggles with addiction; and neighborhoods have declined.² The need to respond to opioid-related social harms have diverted public sector resources from other valuable purposes while still leaving many harms unaddressed.³

2. I have been asked to present opinions related to (i) identifying how the Communities can best utilize the tools and practices available to implement programs aimed at furthering the communities’ efforts to ameliorate and abate the crisis they face; and (ii) estimating the cost of providing these services.

3. Making rapid and deep progress in these two communities will require both a substantial increase in resources and effective coordination of those resources. As set forth in the Expert Report of Dr. Caleb Alexander, a community opioid abatement plan has many components, including initiatives to reduce opioid oversupply and encourage safe opioid use; and to identify and treat individuals with Opioid Use Disorder (OUD). Here I propose an Abatement Plan for the Cuyahoga and Summit communities, which includes measures to achieve the goals discussed by Dr. Alexander. The components of the Abatement Plan outlined below can be summarized in the following four categories: Treatment; Harm Reduction; Primary Prevention; and System Coordination.

- **Treatment** includes additional capacity for detoxification, inpatient and outpatient therapy, recovery housing, and medication-assisted treatment (or MAT), resources for

¹ See T. Gilson Deposition Tr. 176:14-178:12; A. Vince Deposition Tr. 186:6-187:7.

² I understand that the Expert Report of Jonathan Gruber documents the growth in opioid shipments in the last two decades, the relationship between this growth and opioid-related mortality, and how the initial growth from the mid 1990’s to 2010 precipitated the rapid growth in illicit opioid mortality in recent years. I further understand that the Expert Report of David Cutler further documents the impact of defendants’ misconduct on social harms including mortality, crime, and the demand for foster care services.

³ I understand that the Expert Report of Thomas McGuire on damages estimates the costs faced by Bellwether governments due to the opioid crisis.

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better connecting individuals to treatment services, and targeted interventions with high priority populations – those in jail, families in the child welfare system, and opioid-using pregnant women and new mothers.

- **Harm reduction** includes distributing naloxone, resources for needle exchange, and interventions to treat and reduce the spread of HIV and hepatitis C among intravenous drug users, as well as the provision of housing support for vulnerable populations that have high rates of opioid use.
- **Primary prevention** includes media campaigns to reduce opioid use and misuse and decrease the stigma of seeking treatment, school-based prevention programs, resources for law enforcement, drug disposal programs, and medical provider education.
- **System coordination** involves data collection and surveillance to track the evolution of the epidemic in the communities so that resources can be efficiently deployed to their most effective use, staffing to coordinate the overall effort so that the different pieces of the plan work effectively together, and resources for law enforcement so that individuals can be more effectively connected to services and appropriate supervision.

4. The types of programs and services that fall into each of these categories, as well as recommended elements of such programs and services, are described in further detail in the Expert Reports of Dr. Alexander, Dr. Theodore Parran, and Dr. Anna Lembke. As noted by Dr. Alexander, while there are many elements of an opioid-related abatement program, there is not a one-size fits-all approach to abating the problem in all communities. As set forth in my opinions below, this report focuses on and sets forth the scope of the programs and services recommended in the Abatement Plan for the Cuyahoga and Summit communities and ultimately the costs of efforts required to abate the opioid crisis in these communities.

II. QUALIFICATIONS

5. I am the Malcolm Wiener Professor of Public Policy at the Harvard Kennedy School, where I direct the Taubman Center for State and Local Government as well as the Government Performance Lab (GPL).

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6. I received a Ph.D. in Economics from Harvard University in 1996. I have published numerous peer-reviewed journal articles, essays, and book chapters. I teach courses on the Economic Analysis of Public Policy, American Economic Policy, and Government Turnarounds. I specialize in Public Finance and Health Economics as well as state and local government policies. My research focuses on tax, budget, and health policy, impact evaluations of social programs, and strategies for making government social service agencies more effective. My CV is included as Appendix A.

7. I have twice served in government. From 1998-1999, I was Special Assistant to the President for Economic Policy and coordinated the National Economic Council's Social Security reform technical working group. From 2009 to 2010, I worked at the Office of Management and Budget, first as Executive Associate Director and Chief Economist and then as Acting Deputy Director. In both periods of government service, I supervised the development of cost estimates of complicated multi-faceted government initiatives, including Social Security reform, the American Recovery and Reinvestment Act of 2009, and the Affordable Care Act of 2010.⁴

8. The Government Performance Lab (GPL) at the Harvard Kennedy School, which I founded in 2011 and direct, provides pro bono technical assistance to state and local government agencies, mostly social service agencies, to help them improve the results they achieve for their residents. We help agencies undertake performance improvement projects by embedding recent graduates of public policy, law, and business schools in government agencies, typically for 18-24 months.

9. To date, GPL has undertaken close to 100 projects in more than 30 states. These projects include providing assistance in the areas of behavioral health and homelessness,

⁴ American Recovery and Reinvestment Act of 2009: Law, Explanation and Analysis: P.L. 111-5, as Signed by the President on February 17, 2009. Chicago, Ill.: CCH, 2009; United States. Compilation Of Patient Protection and Affordable Care Act: as Amended through November 1, 2010 Including Patient Protection and Affordable Care Act Health-Related Portions of the Health Care and Education Reconciliation Act of 2010. Washington: U.S. Government Printing Office, 2010.

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criminal justice, education and jobs, and children and families. We currently have 40 employees, nearly all embedded in state, city, and county agencies around the country.⁵

10. A significant share of GPL's work has involved substance use issues. For example, we worked with the states of Connecticut and Florida to develop systems to better connect parents in their child welfare systems with substance use treatment. We have worked with Denver, Colorado and the Commonwealth of Massachusetts on identifying chronically homeless individuals with complicated mental health and substance use challenges and prioritizing them for supportive housing. We worked with the Louisville, Kentucky Metro Jail on an initiative to connect releasees to substance use treatment. We worked with Bernalillo County, New Mexico (Albuquerque), on how to most effectively spend the resources from a new behavioral health levy to combat addiction and other behavioral health challenges.⁶

11. I am being compensated on an hourly basis for my work on this matter at a rate of \$900 per hour and \$1,000 per hour for any deposition or trial testimony I am required to provide. I am also being reimbursed for my out-of-pocket expenses. My compensation does not depend on the outcome of the case or the substance of my opinions.

12. The opinions and conclusions in this report are based on information and documentation available to me at this time, and I reserve the right to supplement and revise the opinions and conclusions expressed in this report based on additional evidence or information provided to me after the date of this report. The materials I considered in preparing my analysis and forming my conclusions are attached as Appendix B.

III. SUMMARY OF OPINIONS

13. In this report I present the following opinions and describe the evidence and analysis related thereto:

14. I conclude that there is a framework within the area of applied economics by which an economist can reasonably evaluate (a) the level of abatement resources needed for the next 15 years in the communities of Cuyahoga County and Summit County, Ohio, to abate the

⁵ A full list of the projects I have overseen by jurisdiction is set forth at <https://govlab.hks.harvard.edu/projects> and listed in Appendix E.

⁶ Id.

opioid crisis and (b) the cost of those resources. In particular, an economist can use data regarding the target populations and their service needs as well as community input and the opinions of other medical and epidemiological experts to develop the scope of programming needed in order to address the opioid crisis in these communities. As discussed further below, the economist can utilize standard and widely accepted tools of empirical economic analysis and public sector budgeting, as informed by professional experience and judgment, to estimate the costs of providing this programming.

15. My analysis estimates the cost of abatement programming required from 2020-34 to abate the harms in the two communities resulting from the opioid crisis. The economic literature on public health recognizes that it is not realistic to assume that health policies will help all affected individuals -- even the best designed policies will not be successful in reaching every member of a target population, and some addicted individuals will choose not to receive treatment when available.

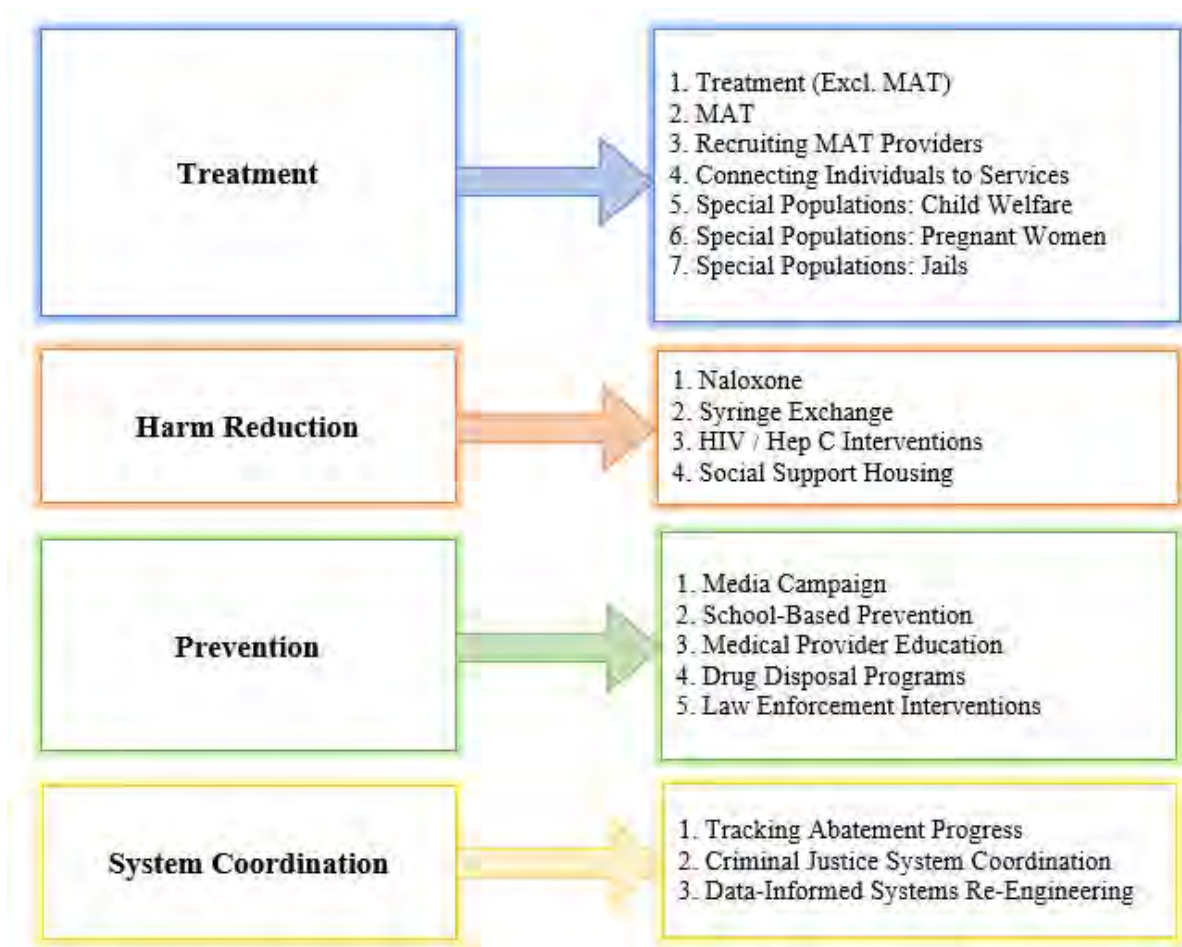
16. Instead, the analysis attempts to estimate the costs to implement a policy based on a feasible and realistic view of what can be achieved. Estimates of the cost of treatment -- the largest component of cost under the Abatement Plan -- are based on the view that, even with intensive expansion of resources, the number of individuals with opioid use disorder (OUD) who receive treatment (currently about 20 percent of the OUD population) will double to 40 percent, and the number of individuals who currently receive Medication Assisted Treatment, roughly seven percent of the OUD population, will quadruple to 27 percent. These projections are discussed further below.⁷

17. As discussed further below, the Abatement Plan identifies four major area of needed services: treatment programs, harm reduction programs, prevention programs, and system coordination efforts. Several specific programs are identified in each category (see Figure 1). This report presents costs estimates for seven major programs which are expected to account for a large portion of the program costs. I intend to supplement this report with cost estimates for the remaining programs after reviewing information recently provided in discovery

⁷ My estimates of plan costs are not reduced to reflect costs arising in connection with heroin use in the community where the individual had never used prescription opioids.

and related information. My analysis does not address how abatement costs should be shared among various entities or parties.

Figure 1
Elements for the Community Abatement Strategy
Cuyahoga and Summit Counties



18. Based on my study of the abatement needs of the Cuyahoga and Summit communities and application of the methodologies and analysis described in this report, I estimate that implementation of the programs of Abatement Plan evaluated to date will cost \$5.0 billion in Cuyahoga County and \$2.2 billion in Summit County over the next 15 years. These totals reflect estimates of the largest categories of costs currently faced by the Cuyahoga and Summit Communities in abating the opioid crisis as well as estimates of additional costs needed to make greater progress in abating opioid disorders. In addition, I am informed that the costs of

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certain services contemplated in the Plan have been or will be provided in documents or testimony from the Counties. To the extent that the costs of additional elements of the Plan are required, I am prepared to supplement this Report. Estimates of the annual elements of the costs of each of these programs for which costs have been estimated and the sources of the data used in developing these estimates are reported in an appendix to this report.⁸ I understand other expert reports also discuss the effectiveness of these interventions at reducing mortality and morbidity associated with opioid addiction.⁹

19. Available studies indicate that an intensive effort like the one described in this plan is needed to address the problems faced in these communities because of the opioid epidemic and further indicate that implementation of such a range of programs will result in reduced mortality and morbidity associated with opioid addiction.¹⁰

20. Because it is possible that the epidemic will evolve in ways that either reduce or increase the need for resources relative to my primary estimates, it is appropriate for me as an economist to provide a range of estimates for lower cost and higher cost scenarios.¹¹ It is also important to build in feedback mechanisms into the Abatement Plan, so that the level of abatement resources and the allocation of those resources can be adjusted over time as new information about needs becomes available.

⁸ The Abatement Plan provides estimates for certain of the largest resource needs in these communities. In particular, and as set forth in Tables 1 and 2 below, costs are estimated for the following categories: treatment, MAT, recruiting providers to administer MAT, naloxone, the syringe exchange program, a mass media campaign, and school-based prevention. In addition, I am informed that the costs of certain services contemplated in the Plan have been or will be provided in documents or testimony from the Counties. To the extent that the costs of additional elements of the Plan are required, I am prepared to supplement this Report.

⁹ I understand that these are discussed in the Expert Reports of Anna Lembke, Caleb Alexander, and Katherine Keyes.

¹⁰ Pitt, Allison L., Keith Humphreys and Margaret L. Brandeau. "Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic." *AJPH Open Themed Research* Vol. 108 no. 10 (Oct 2018): 1394-1400. Pitt, et al. conclude that "[p]olicies that focus on services for currently addicted people provide health benefits immediately without causing harm. However, no epidemic has ever been averted solely by treating single affected cases. Instead, portfolios of policies will likely be required, including those that prevent addiction, treat addiction, and mitigate its effects." (at 1399).

¹¹ As an example, see the range of projections of future opioid deaths presented in M. Blau, "STAT forecast: Opioids could kill nearly 500,000 Americans in the next decade," <https://www.statnews.com/2017/06/27/opioid-deaths-forecast> (June 27, 2017).

21. The rationale and justification for these opinions are set forth in more detail in the remainder of this report.

IV. BACKGROUND ON THE OPIOID EPIDEMIC IN CUYAHOGA AND SUMMIT COUNTY AND UNMET NEEDS

22. The nationwide opioid epidemic is hitting the Cuyahoga and Summit communities particularly hard. The Cuyahoga County Opiate Task Force has estimated that as of 2016, 73,200 Cuyahoga residents misuse or abuse prescription opioids each year in the county and that 20,562 of them make the switch to heroin each year.¹² Opioid-related overdose deaths in Cuyahoga County increased from 93 in 2005; to 191 in 2012; to 524 in 2017 as the use of Fentanyl spread.¹³ In Summit County, the number of opioid-related overdose deaths rose from less than 20 in 2005 to 60 in 2012 to 190 in 2017.¹⁴ I understand that the Expert Report of Jonathan Gruber documents that the per capita overdose death rate in Cuyahoga County is among the highest county-level rates in the nation. And these mortality rates understate the true magnitude of opioid-related health risks since many additional individuals overdosed but were saved by application of opioid antagonists such as naloxone by first responders. The Cuyahoga medical examiner reports that nearly 900 people were saved in Cuyahoga county through project DAWN (Deaths Avoided with Naloxone) in 2017.¹⁵

23. Hundreds of children are being adversely affected by the opioid crisis in both communities. Between 2013 and 2017, Summit County reported 426 hospitalizations due to neonatal abstinence syndrome (NAS) and Cuyahoga County reported 629.¹⁶ In 2017 alone, Summit County reported 79 hospitalizations due to NAS in 2017; Cuyahoga County reported 137 NAS hospitalizations.

24. As discussed further below, obtaining information about local conditions and service gaps from local experts is a key element in the design of government policy and is a

¹² Cuyahoga County Opiate Task Force Report, 2016.

¹³ Source: Multiple Causes of Death Data, accesses on CDC Wonder.

¹⁴ Source: Multiple Causes of Death Data, accesses on CDC Wonder.

¹⁵ Cuyahoga County Medical Examiner's Office, Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County, http://medicalexaminer.cuyahogacounty.us/pdf_medicalexaminer/enf-US/HeroinFentanylReports/090718-HeroinFentanylCocaine-ME-report-Aug.pdf (Sep. 17, 2018), p. 5.

¹⁶ Source: https://odh.ohio.gov/wps/wcm/connect/gov/4cad708c-ba99-4b8b-b425-01cfef119c5d/2017+NAS+County+Table+12.3.2018.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-4cad708c-ba99-4b8b-b425-01cfef119c5d-muueFzr

standard element in the framework used in GPL projects. In the initial phase of this project, I had extensive conversations about opioid-related issues with local government officials, law enforcement officials, medical practitioners, and social service providers. A list of individuals interviewed in the process is attached as Appendix C. Each of these individuals stressed that needs for opioid-related services often go unmet due to the limitations of available resource and related obstacles to providing opioid-related services. This section briefly summarizes some observations based on these conversations, information provided in response to these conversations, and transcripts of depositions of community members. My abatement plan takes into account the information I learned in these interviews.

25. My discussions with local law enforcement officials indicated that EMS, police, and fire department resources are being diverted from other activities in order to respond to opioid overdoses. The Cleveland Police Department reports that officers who previously were assigned to disrupting the operations of drug dealers now spend all of their time investigating overdose deaths.¹⁷

26. While additional treatment resources have been added, there is neither enough treatment capacity nor sufficient coordination to connect individuals who need treatment for opioid addiction to get services. In addition, in Summit County, the director of the ADM Board reports that only about 20 percent of individuals with overdose deaths had previously received services and that their working assumption is that only 10 percent of the people needing help get it.¹⁸ The Summit Opioid Task Force reports wait times of 26 days for residential treatment.¹⁹ However, local experts also note that people can only be put on wait lists for services after they have had their need assessed, and if there were a sufficient number of assessors, the waiting lists for treatment would appear much greater.²⁰ Lack of 24-7 access to treatment misses the often-narrow window of opportunity when a person may be open to entering treatment, for example after an overdose.

¹⁷ Deposition of Gary Gingell, November 20, 2018, pp. 237, 175-176.

¹⁸ Call with G. Craig of Summit County Alcohol, Drug Addiction & Mental Health Services Board, July 3, 2018.

¹⁹ Summit County Opiate Task Force, Key Stakeholders Annual Meeting, Meeting Notes 6/25/2018 (SUMMIT_001164135), at p. 2.

²⁰ Comment by D. Skoda at Round-table Meeting with Representatives of the Summit County Community, July 11, 2018.

27. Based on this review and my experience as an economist and policy analyst, significant needs in the Cuyahoga and Summit Communities are currently going unmet and significant additional resources are required in order to meet the demand for opioid-related services.

V. FRAMEWORK AND METHODOLOGY

28. As noted above, the development of the Abatement Plan for the Cuyahoga and Summit Communities and estimation of the funding needed for this plan applies the general methodological framework used in my prior analysis of government programs, in my academic and government work, as well as in the nearly 100 projects that have been implemented under my direction at the GPL. My framework follows the standard approaches used by the Congressional Budget Office²¹, the President's Office of Management and Budget²² and the Government Accountability Office²³ in estimating costs and projecting budgets.

29. To estimate the cost of implementing the Abatement Plan, I first gathered qualitative information about the need for opioid-related services in the Cuyahoga and Summit communities, including assessments of the populations in need of services, existing infrastructure and service gaps, and information on the contours and severity of the epidemic. This initial information gathering phase of my analysis involved meetings and phone calls with community members involved in addressing the opioid crisis, including medical service providers, social service providers and individuals in government. Information gained in this review helped to identify the services needed in the Cuyahoga and Summit communities, the extent to which services can be expanded, the length of the "ramp up" period, and the length of time for which services are likely to be needed.

²¹ Congressional Budget Office, "How CBO Prepares Cost Estimates," (February 2018) (<https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53519-costestimates.pdf>)

²² Executive Office of the President, Office of Management and Budget, "Circular No. A-11, Preparation, Submission and Execution of the Budget," (June 2018).

²³ Government Accountability Office, "GAO Cost Estimating and Assessment Guide," (March 2009) (<https://www.gao.gov/new.items/d093sp.pdf>)

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30. Second, I have collected data measuring the extent of the opioid crisis and current response efforts in the Cuyahoga and Summit communities. This has included the review of public data on the extent of OUD; analyses on the quality and reliability of available OUD data; and information on OUD treatment programs in these communities. This analysis has also included efforts to estimate the costs of opioid treatment, harm reduction, prevention, and system coordination.

31. Finally, I have reviewed the published literature on remedies to the opioid epidemic, on the effectiveness of proposed interventions, and on the experience of other communities that have adopted similar interventions.²⁴

32. As noted, the approach of identifying the target population, assessing population needs, selecting the set of programs that can best meet these needs, and then estimating the costs of providing the programming is widely applied in public economics and policy analysis. Evaluating community needs based on quantitative data and then verifying the estimates based on information obtained from local experts is also standard practice. Analysis of related topics such as program design and implementation, budgeting, and forecasting are central to the curriculum at the Harvard University's Kennedy School of Government where I teach courses in the "Economic Analysis of Public Policy" and "Government Turnarounds" which directly relate to these topics. As GPL's name suggests, setting performance-based goals for projects and implementing on-going monitoring and continuous improvement efforts to enable projects to meet their goals is a significant part of the Lab's work and has been a primary emphasis of the projects that I direct there. Policy design and evaluation also requires the exercise of

²⁴ Examples of the literature reviewed include: Centers for Disease Control and Prevention, *Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States*. 2018. Brooklyn, Johan and Stacey C. Sigmon, "Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact," *Journal of Addiction Medicine* 2017, 11(4): 286-292. Hernandez, Yamilette et al., "How Massachusetts, Vermont, and New York are Taking Action to Address the Opioid Epidemic," *American Journal of Public Health*, 2018, 108:12, 1621-1622. U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, *Facing Addiction in America: The Surgeon General's Spotlight on Opioids*. Washington, DC: HHS, September 2018. National Academies of Sciences, Engineering, and Medicine. 2017. *Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use*. Washington, DC: The National Academies Press.

professional judgement, which I have developed over the past 22 years in undertaking related types of analyses.

VI. OVERVIEW OF ABATEMENT PLAN

A. Origins of the Abatement Plan

33. Communities around the U.S. that are showing incipient progress in reducing opioid use and opioid deaths have followed a common set of strategies. They have increased the availability of treatment, including MAT. They have reduced obstacles that prevent individuals from obtaining access to the available treatment. They have invested in harm reduction, increasing access to naloxone and fentanyl test strips to prevent deaths among those still misusing opiates and taking steps to minimize the spread of HIV and Hepatitis C among heroin users. They have invested in primary prevention to reduce the number of individuals that newly develop Opioid Use Disorder. They have put resources into system coordination so that new developments are tracked and quickly responded to, resources are allocated effectively, and the rate of individuals falling through the cracks because of failed handoffs is minimized.

34. The Abatement Plan outlined and evaluated in this report builds on approaches that have been implemented in other areas and shown to be effective.²⁵ The Abatement Plan also builds on abatement strategies currently being developed in the Cuyahoga and Summit communities.

35. For example, in February – March 2018, Summit County convened a group of government and other stakeholders in the County to identify resources, gaps, and barriers in the existing systems for responding to the opioid crisis.²⁶ The group also aimed to better meet treatment needs of adults with opioid addiction in contact with the criminal justice system. At this meeting, results of a recent Sequential Intercept Mapping (SIM) exercise were presented,

²⁵ See, for example: Centers for Disease Control and Prevention, Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States. 2018; U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, Facing Addiction in America: The Surgeon General's Spotlight on Opioids. Washington, DC: HHS, September 2018. National Academies of Sciences, Engineering, and Medicine. 2017. Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use. Washington, DC: The National Academies Press.

²⁶ See Summit County, Sequential Intercept Mapping and Action Planning for Opioid Epidemic Response, March 20, 2019 (SUMMIT_000349556).

which provided a comprehensive picture of how people with substance use disorders and co-occurring disorders flow through the Summit County criminal justice system, including six “intercept points” and an action plan.²⁷ The Abatement Plan adds resources at many of these intercept points to better connect individuals in need of opioid use treatment and other services to these services and implements many of the types of programs recommended in the mapping exercise.

36. Similarly, the Cuyahoga County Opiate Task Force has proposed and implemented a number of strategies to combat the opioid epidemic in conjunction with its partners, including, but not limited to: (1) increasing naloxone accessibility to the community by making the reversal kits available through pharmacies and Project DAWN locations; (2) educating local law enforcement on the benefits of carrying naloxone; (3) participating in bi-annual drug take-back days; (4) establishing medication drop boxes; (5) expanding substance use disorder services in MetroHealth emergency departments; (6) providing Safer Opioid Prescribing town hall trainings for prescribers; and (7) targeted media campaigns for heroin/fentanyl prevention and awareness.²⁸ The Abatement Plan incorporates and expands on many of these programs.

37. Furthermore, in their planning exercises, the Cuyahoga and Summit communities have recognized the need for improved coordination of systems to expand access to MAT. One of the tools for accomplishing this the Hub-and-Spoke Model, described in the Alexander Report, and previously implemented in Vermont.²⁹ The Hub-and-Spoke model uses a limited number of specialized, regional addictions treatment centers (called “hubs”) that collaborate with dispersed providers spread elsewhere in the community (called “spokes”). The hubs provide intensive treatment to patients and consult with medical providers treating patients in the general

²⁷ The six intercept points identified are Prevention/Treatment/Regulation, First Contact and Emergency Services, Initial Detention/Initial Court Hearings, Jails and Courts, Reentry, and Probation/Community Supervision.

²⁸ See Cuyahoga County Board of Health, “2018 Injury Prevention Report,” available at http://opiatecollaborative.cuyahogacounty.us/pdf_OpiateCollaborative/en-US/2018AnnualReport.pdf, pp. 2-3, 7; Cuyahoga County Opiate Task Force Report 2016, available at <http://www.ccbh.net/wp-content/uploads/2017/07/2016-CCOTF-Annual-Report.pdf>, at pp. 4, 5.

²⁹ Brooklyn, Johan and Stacey C. Sigmon, “Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact,” *Journal of Addiction Medicine* 2017, 11(4): 286-292.

practice spokes. Under this model, each MAT patient has an established hub, a single MAT prescriber, a pharmacy home, access to a general practice provider who are the medical community, and nurses and clinicians at spoke locations. The approach helps avoid coordination problems resulting from state and federal regulations that limit the ability of providers to offer different forms of MAT (e.g., methadone, buprenorphine, and naltrexone), and facilitates the provision of counselling and related services.

B. Elements of the Abatement Plan

38. As summarized in Figure 1 above, there are four elements of the Abatement Plan:

- Treatment for individuals with OUD
- Harm reduction, including widespread distribution of naloxone and resources for syringe exchanges;
- Primary prevention programs, including media campaigns, school-based prevention programs, and expanded resources for law enforcement; and
- System coordination to track the evolution of the epidemic, coordinate the different pieces of the abatement effort, and improve handoffs between the medical and criminal justice systems.

39. The remainder of this section briefly describes the key elements of the plan. Additional details of the Abatement Plan, including the parameters used in projecting costs, are presented in Appendix D, which presents the cost calculation and identifies the supporting data.

C. Overview of Treatment Services Under Abatement Plan

40. Treatment elements of the Abatement Plan include the provision of treatment services, such as detoxification, inpatient and outpatient therapy, recovery housing, and medication-assisted treatment (or MAT), resources for better connecting individuals to treatment services, and targeted interventions with high priority populations – those in jail, families in the child welfare system, and opioid-using pregnant women. Each of these is briefly addressed in turn.

1. Treatment Services: Non-MAT

41. The American Society of Addiction Medicine (ASAM) identifies the range of services a community needs to provide to appropriately treat addiction and substance-related disorders. These include services for managing withdrawal and related symptoms as well as the provision of a range of psychological counselling and support services. The Abatement Plan would expand the range and scale of services available in the Cuyahoga and Summit communities, including detoxification, residential, partial hospitalization, intensive outpatient, outpatient, recovery housing, and treatment facilities for parents with children.

42. Estimates of the cost of providing treatment services (other than MAT), including the costs of the facilities, under the Abatement plan are summarized in Appendix D, Tables C.1 and S.1 in Appendix D. The cost estimates anticipate that the number of individuals that receive treatment will ramp up over four years such that the number of individuals receiving treatment for OUD will double between 2020 and 2023.³⁰ I understand that the Expert Report of Anna Lembke explains that an effective Abatement Plan could expand its reach in this way by 2024.

2. Treatment Services: MAT

43. A central element of the Abatement Plan is to increase patient access to MAT including buprenorphine, methadone and naltrexone, as part of the broader treatment program. Estimates of the cost of providing MAT need to recognize that not all individuals with OUD will avail themselves of such programs and that it will take some time to equip enough providers with the capacity to offer expanded services. Program costs are estimated under the assumption that the share of individuals in treatment that receive MAT will increase from one-third to two-thirds within four years. Available evidence indicates that some individuals will need to receive MAT for many years and that rates of relapse and return to MAT are high so resources will be required through at least 2034 to ensure that patients continue to have access to MAT.

44. The cost estimates anticipate that the number of individuals who receive MAT in the Communities will expand over the next four years from approximately seven percent of the

³⁰ I assume that in 2020, 20% of individuals with OUD receive treatment in the Cuyahoga and Summit communities, based on the available data on treatment prevalence for individuals with OUD. See for example, SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2: "Only 20% with OUD received specialty addiction treatment."

OOD population currently to approximately 27 percent. I understand that the Expert Report of Anna Lembke explains that an effective Abatement Plan could expand its reach in this way by 2024.

45. Estimates of the cost of providing MAT services under the plan are summarized in Appendix D Tables C.2 and S.2.

3. Recruiting Treatment Providers

46. The State of Ohio reports that “Ohio’s existing prescriber workforce is inadequate to meet the MAT need,” with only two percent of the physician workforce licensed to prescribe buprenorphine, and “most of these physicians are believed to be in the behavioral health field, which means that patients would have limited access to MAT through other physician practices like primary care . . .”³¹ A study of Ohio specialty treatment organizations found that half reported insufficient prescribing capacity.³² Lack of primary care physicians willing and equipped to manage patients receiving MAT is a major barrier to a successful “hub and spokes” model where specialty facilities manage patients through acute stages of their care and then hand patients off to primary care providers to manage the longer-term chronic phase of care.

47. In order to achieve the increased treatment levels described above, additional staff is needed to recruit primary care providers to obtain DEA licenses and become MAT providers. The Abatement Plan calls for funding of six full time nurse practitioners in Cuyahoga and Summit Counties to perform these services.

48. This estimate is presented in Appendix D, Tables C.3 and S.3.

4. Connecting Individuals to Services

49. As discussed above, it can be hard to coordinate treatment for opioid use disorder in Cuyahoga and Summit counties. Many of the hospital emergency departments lack the staff

³¹ Ohio Department of Mental Health and Addiction Services, Workforce development as Part of the 21st Century Cures Act.

³² Todd Molfenter, Carol Sherbeck, Mark Zehner, and Sandy Starr. Buprenorphine Prescribing Availability in a Sample of Ohio Specialty Treatment Organizations, J. Addictive Behav, Ther. Rehabil. 2015 4(2).

necessary to connect overdose patients to treatment. Treatment can be difficult to access outside of business hours, and there is a lack of resources to transport people to treatment.

50. The Abatement Plan includes staffing for a 24 hour a day / 7 days a week treatment connector hot line that could receive calls from individuals seeking treatment and from family members, emergency responders, or medical professionals trying to connect individuals to treatment services. It also includes resources to staff each major hospital emergency departments with social workers and recovery coaches who can connect individuals with substance use disorders to treatment. The Abatement Plan anticipates that new staff members will be required in Cuyahoga and Summit Counties to connect individuals to services. The plan also includes resources to pay for transportation to treatment sites for individuals who do not have a car.

51. The final component of “connections to services” is an expansion of web-based referral capacity. Research has shown that some individuals are more comfortable learning about treatment options and enrolling in treatment online rather than via a phone call or in person conversation.

52. Estimates of the costs of connecting individuals to services and treatment are summarized in Appendix D, Tables C.4 and S.4.

5. Special Population: Child Welfare

53. The United States Department of Health and Human Services (HHS) concluded that parental “[s]ubstance use, including opioid misuse, has downstream effects on children’s welfare and family stability, and these in turn can place a substantial burden on communities.”³³ The HHS report further found that counties with higher rates of drug overdose deaths and drug-related hospitalizations also have higher child welfare caseload rates and that substance use related cases are associated with more complex and severe child welfare cases.³⁴

54. The Abatement Plan provides the following resources for child welfare-involved families:

³³ ASPE Research Brief, US Department of Health and Human Services, “The Relationship between Substance Use Indicators and Child Welfare Caseloads,” Revised March 9, 2018, p. 7.

³⁴ ASPE Research Brief, US Department of Health and Human Services, “The Relationship between Substance Use Indicators and Child Welfare Caseloads,” Revised March 9, 2018, p. 1.

- Additional social workers to allow smaller caseloads for case workers managing complex cases involving substance abuse;
- Family advocates – peer coaches who have themselves recovered from substance use -- to assist parents in addressing their addictions;
- A trauma counselor in each community to provide services and advice to staff members at the Divisions of Children and Family Services who are managing cases in which parents or caregivers have died from drug overdoses.;
- Additional employees in Cuyahoga and Summit Counties to recruit foster families for placements of children affected by the opioid epidemic.
- Boarding costs for the placement of affected children in foster care.

55. Estimates of the abatement costs associated with child welfare services are summarized in Appendix D, Tables C.5 and S.5.

6. Special Populations: Pregnant Women

56. Prenatal exposure to drugs, and opioids in particular, have been an increasing issue in Ohio and in the Cuyahoga and Summit Communities. In 2016 alone, nearly 2,200 mothers in Ohio had an opioid drug abuse or dependence issue at the time of delivery.³⁵ Between 2013 and 2017 nearly 630 infants in Cuyahoga County and nearly 420 infants in Summit County were hospitalized due to Neonatal Abstinence Syndrome (NAS) resulting from exposure to opioids and other drugs in utero.³⁶

57. In addition to the treatment alternatives described above, the Abatement Plan provides resources for a maternal-infant home visiting program that provides specially trained nurses to regularly visit with new mothers and mothers-to-be with opioid use disorder to provide coaching on health and parenting, including substance use treatment.³⁷

³⁵ 2017 Ohio Neonatal Abstinence Syndrome Report, available at <https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/media/nas-datatable-2017>.

³⁶ 2017 Ohio Neonatal Abstinence Syndrome County Report, available at https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/resources/NAS_Hospital_Reporting_in_Ohio.

³⁷ The federal program is described at: https://mchb.hrsa.gov/sites/default/files/mchb/MaternalChildHealthInitiatives/HomeVisiting/pdf/program_brief.pdf

58. Estimates of these costs are summarized in Appendix D, Tables C.6 and S.6.

7. Special Population: Jails

59. It is widely recognized that a substantial share of jail inmates have substance misuse problems.³⁸ The high OUD rates create challenges for the jail system: inmates going through detoxification require medical attention and additional staff care. However, currently both Cuyahoga and Summit County jails typically house such inmates within the general population. As a result, at times inmates need to be transported and housed in a hospital during this process at significant expense to the counties. And without sufficient resources to be able to start substance abuse treatment while inmates are in jail or to connect them effectively to treatment options upon release, the jails observe individuals committing opioid-related offenses soon after release and cycling back into jail.

60. The Abatement Plan would approximately double substance abuse treatments at Cuyahoga County's Bedford Heights and Euclid facilities and would add a detoxification unit at Cuyahoga County jail. Services also will be expanded in Summit County. Plans call for hiring additional social workers in Cuyahoga and Summit Counties to connect newly released inmates with OUD with treatment and transition services. Transitional housing also would be made available to a portion of inmates with OUD being released from prison.

61. Estimates of these abatement costs for the jails are summarized in Appendix D, Tables C.7 and S.7.

D. Overview of Harm Reduction Services Under the Abatement Plan

1. Naloxone

62. Naloxone is an opioid antagonist that has proven to be highly successful in reducing mortality when delivered to individuals experiencing an opioid-related overdose.³⁹ Naloxone is often administered by first responders, such as individuals from the divisions of Emergency Medical Services, Fire and Police. However, first responders may not arrive in time

³⁸ CUYAH_003505168 ("The CCCC currently provides housing and services for 26,000 inmates annually, the majority are inmates under a pre-trial status. Of this population, approximately 75% have a substance use disorder.")

³⁹ See National Institute on Drug Abuse, "Opioid Reversal with Naloxone (Narcan, Evzio)," revised April 2018, available at <https://www.drugabuse.gov/related-topics/opioid-overdose-reversal-naloxone-narcan-evzio>.

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to administer naloxone and prevent a death. Indeed, the communities have already begun distributing naloxone kits to individuals through Project DAWN programs. I understand that Dr. Theodore Parran explains that fatalities from opioid-related overdoses would be reduced if naloxone kits were made more widely available to individuals with OUD, to their friends and family members, and if kits continue to be available to all first responders in the communities. He recommends that, on a community-wide basis, 3 to 9 doses (1.5 to 4.5 naloxone kits) be made available for each opioid-dependent individual, including individuals in treatment. Kits would be made available to the individuals, as well as their relatives and close friends.

63. Recognizing that not all individuals with OUD and their family and friends would take advantage of the plan, the Abatement Plan anticipates that two naloxone kits would be distributed in the community per year for each individual with OUD. These kits have a shelf life of two years and thus will need to be replaced regularly, even if not used. The Abatement Plan also provides for two public health employees in Cuyahoga County and one in Summit County to coordinate the logistics of the distribution program.

64. The Abatement Plan also continues to provide for sufficient naloxone availability for all first responders in the communities. In particular, based on 2017 purchasing data for the City of Cleveland the plan assumes that approximately 12,000 doses of naloxone will be purchased each year in Cuyahoga County and approximately 5,200 doses of naloxone will be purchased in Summit County, both to replace naloxone doses that have been used and those that have expired.

65. Appendix D Tables I, C.8 and S.8 reports estimates of Naloxone-related costs under the Abatement Plan.

2. Syringe Exchange Programs

66. Both communities operate needle exchange programs where intravenous drug users can exchange used needles for clean needles. Such programs have been shown to reduce infections with HIV and hepatitis C. In addition, these programs can counsel drug users on treatment options, encourage users to be tested for HIV and hepatitis C, and distribute fentanyl strips. The Abatement Plan would increase the number of syringe exchange locations in each community and expand the hours that they are open. Specifically, it would increase the needles exchanged in Cuyahoga County by 50 percent and the needles exchanged in Summit County by two-thirds.

67. Appendix D, Tables C.9 and S.9 report estimates of costs of the Syringe Exchange Program.

3. HIV/Hepatitis C Interventions

68. Intravenous use of heroin and other opioids is associated with an elevated risk of infection with HIV and hepatitis C.⁴⁰ Treating those infected with HIV and hepatitis C can reduce the harm to the individuals and reduce the spread of these diseases to others. The abatement plan includes resources for individuals who inject opioids to receive screening for HIV and hepatitis C, as well as resources to treat those whose HIV and hepatitis C was obtained from injection of opioids.

69. Estimates of these costs of HIV/Hepatitis C interventions are reported in Appendix D, Tables C.10 and S.10.

4. Social Support Housing

70. Research shows that unstable housing is associated with a higher risk of overdose death among those with substance use disorders.⁴¹ The Abatement Plan proposes to provide two kinds of housing resources. The first is transitional housing for individuals with a history of opioid misuse being released from jail or prison.⁴² The second is permanent supportive housing for homeless individuals with a history of opioid misuse.

71. Estimates of these social support housing costs under the Abatement Plan are reported in Appendix D, Tables C.11 and S.11.

E. Overview of Prevention Services Under the Abatement Plan

72. The primary prevention portion of the Abatement Plan aims to prevent individuals from becoming opioid users and misusers. It would allocate resources for a community-wide media campaign, for school-based prevention programs, for medical provider education and outreach, for drug disposal programs, and for law enforcement interventions. Each of these is briefly addressed in turn.

⁴⁰ <https://www.drugabuse.gov/publications/research-reports/heroin/why-are-heroin-users-special-risk-contracting-hiv-aids-hepatitis-b-c>

⁴¹ For example, a Massachusetts Department of Health study found that the opioid-related death rate for individuals experiencing homelessness was 16 to 30 times greater than the rest of the population. (<https://www.mass.gov/files/documents/2017/08/31/data-brief-chapter-55-aug-2017.pdf>)

⁴² This component is covered in the Special Populations: Jails cost category.

1. Media Campaigns

73. Media campaigns can play several important roles in combatting the opioid epidemic. First, they can educate individuals about the risks associated with prescription opioids so that they can make informed decisions about approaches to pain management. Second, they can educate individuals about the safe use of opioids, such as the benefits of keeping the duration of prescription opioid use as short as possible and of disposing of unused pills. Third, they can make individuals aware of specific resources available in their community such as drug disposal programs. Fourth, media campaigns can reduce the stigma associated with seeking treatment and also provide information to individuals about how to access treatment. The Abatement Plan provides resources to each community in line with prior successful public health media campaign's such as the FDA's "The Real Cost" media campaign to prevent youth from using tobacco.⁴³

74. The cost estimates are provided in Appendix D Tables C.12 and S.12.

2. School-based Prevention Programs

75. The proposed school-based prevention program combines an evidence-based universal prevention effort with intensive referral and case-management effort for students showing early signs of being at risk for substance abuse.

76. Evidence-based school-wide programs such as LifeSkills Training (LST) and Project Towards No Drug Abuse (TND) have been shown to reduce adolescent substance use in multiple randomized trials demonstrating long-term effects.⁴⁴ In the abatement plan, I assume that programming is delivered to every student from sixth grade through twelfth grade – approximately 106,000 students in the Cuyahoga community and approximately 46,000 in the Summit community. Schools can also play an important role in identifying students who are showing early signs of being at risk for substance abuse and connecting those students to services. School districts such as New Haven have set up and staffed programs in which

⁴³ MacMonegle, Anna J., James Nonnemaker, Jennifer C. Duke, Matthew C. Farrelly, Xiaoquan Zhao, Janine C. Delahanty, Alexandria A. Smith, Pamela Rao and Jane A. Allen. "Cost-Effectiveness Analysis of The Real Cost Campaign's Effect on Smoking Prevention." *American Journal of Preventive Medicine* 55 no. 3 (2018): 319-325.

⁴⁴ Kris Glunt, "School-based Substance Abuse Prevention," EPISCenter, available at <http://www.episcenter.psu.edu/sites/default/files/Presentations/SSC%20Presentation.pdf>, pp. 8, 17-19, 26, 34.

educators within each school meet regularly to review the list of students who need services and then follow up to make sure the connections to services actually occur.⁴⁵ The abatement plan provides resources so that every high school and middle school in the Communities has a sufficient number of social workers to coordinate the school's efforts to connect at risk youth to services.

77. The cost estimates are provided in Appendix D, Tables C.13 and S.13.

3. Medical Provider Education and Outreach

78. Studies have found that medical system quality improvement efforts that educate providers about appropriate prescribing practices can significantly reduce opioid overprescribing. For example, a recent study of a coordinated effort by a medical system in Maryland found that a combination of provider education and accountability, enhanced oversight, tools to right-size postoperative discharge prescriptions, and reduction of default amount on standard opioid prescription orders resulted in a 58 percent decline in morphine milligram equivalents per clinical encounter.⁴⁶ The Abatement Plan would fund individuals to work with provider groups and medical systems to educate providers, address overprescribing, and spread best prescribing practices.

79. Estimates of the costs of the medical provider education and outreach programs are provided in Appendix D, Tables C.14 and S.14.

4. Drug Disposal Programs

80. Both communities have drug disposal programs including drug drop box sites and "take back your meds" events. The abatement plan provides resources to double the number of drop boxes installed as well as the number of events.

81. Estimates of these costs are provided in Appendix D, Tables C.15 and S.15.

5. Law Enforcement

82. In both Cleveland and Akron, police officials report that the opioid epidemic has required their departments to redeploy resources from other policing activities. In Cleveland, an

⁴⁵ https://www.newhavenct.gov/depts/youth_services/stat.htm.

⁴⁶ Barry R. Meisenberg, MD; Jennifer Grover, PA; Colson Campbell, BS; Daniel Korpon, MS. Assessment of Opioid Prescribing Practices Before and After Implementation of a Health System Intervention to Reduce Opioid Overprescribing. JAMA Open Network, September 28, 2018.

entire unit that was previously dedicated to disrupting the activities of drug dealers, today is instead assigned to investigate drug overdose deaths.⁴⁷ In Akron, a two-person team investigates overdose deaths; the department notes that each requires an investigation with a similar level of detail as a homicide.⁴⁸ In Cleveland, police officials estimated that it would require an additional 20-25 officers to return to the level of service that was provided before the opioid epidemic and in Akron, at least two additional officers are needed to investigate overdose deaths.⁴⁹ The Abatement Plan provides additional staffing to community law enforcement agencies to investigate overdose deaths.

83. Additionally, both the city and county prosecutor's offices in the Communities have had to divert resources from prosecuting other crimes to prosecuting opioid related offenses. The Abatement Plan provides additional prosecutors to the community who can focus on prosecuting opioid-related crime.

84. Estimates of law enforcement costs are provided in Appendix D, Tables C.16 and S.16.

F. System Coordination

85. The Abatement Plan would dedicate a large amount of resources toward preventing and treating opioid addiction and avoiding and reducing the harms associated with improper opioid use. Achieving maximum impact will require effective coordination of the different pieces of the plan and of the different community partners responsible for implementing the different pieces. It will also require the ability to track progress and unmet needs using high-frequency data so as to reallocate resources to their highest value use as the nature of the epidemic evolves. Toward these ends, the Abatement Plan includes resources to system coordination.

1. Tracking Abatement Progress

86. In the Cuyahoga and Summit communities, the County Medical Examiners perform two important functions that are critical to the communities' ability to track and quickly respond to changing patterns of opioid use. First, they perform autopsies that can determine

⁴⁷ Deposition of Gary Gingell, November 20, 2018, pp. 237, 175-176.

⁴⁸ See AKRON_001121744 and AKRON_001121745

⁴⁹ See Deposition of Gary Gingell, November 20, 2018, pp. 243-244; AKRON_001121745.

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what substances were responsible for overdose deaths. Second, they test drugs seized by police to determine what the substances are. The rise in overdose deaths and in the need for testing of drugs has resulted in an unsustainable work load for the medical examiner offices. The Abatement Plan would add staff to the Cuyahoga medical examiner's office and the Summit medical examiner's office.

87. Estimated costs of tracking the abatement progress are presented in Appendix D, Tables C.17 and S.17.

2. Court System Resources

88. The court systems in each community perform important roles in connecting individuals to treatment services. However, there are often several-week delays between when referrals to services are made and when assessments occur and then further delays before treatment can begin.⁵⁰ The Abatement Plan provides each community's court system with additional staff members who would 1) keep judges up to date on treatment options in the community; 2) track the docket of individuals who have been referred to drug treatment services to measure how quickly connections to services are being made; 3) intervene with service providers to reduce treatment delays; and 4) represent the court system in the abatement initiative systems re-engineering processes.

89. Estimated costs of additional court system resources are presented in Appendix D, Tables C.18 and S.18.

3. Data Informed Systems Re-Engineering and Management

90. The Abatement Plan would provide each community with funding to set up a team to coordinate the overall effort and to work with the multitude of government agencies, medical institutions, and service providers to troubleshoot problems, develop continuous improvement efforts, and identify opportunities to re-engineer how individuals are connected to services to reduce the number of people who fall through the cracks. The team would be responsible for establishing high frequency (weekly and monthly) metrics for tracking the progress and efficacy of the Abatement Plan and for convening relevant stakeholders to

⁵⁰ Summit County, Sequential Intercept Mapping and Action Planning for Opioid Epidemic Response, March 20, 2019 (SUMMIT_000349556), at p. 15; Comment by D. Skoda at Roundtable Meeting with Summit County Community Members, July 11, 2018.

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collaboratively review the metrics and determine how to take action so as to maximize the number of residents who receive needed treatment, minimize the harms associated with opioid use, and reduce the flow of new individuals who use or become addicted to opioids. The abatement Plan envisions a five-person team in each community made up of an executive director, two program managers, one data analyst, and one staff assistant.

91. Estimates of these costs are summarized in Appendix D, Tables C.19 and S.19.

VII. ESTIMATED COST OF ABATEMENT PLAN

92. Tables 1 and 2 summarize the costs of the Abatement Plan for the programs evaluated to date for Cuyahoga and Summit, respectively. These costs include both the costs of continuing current efforts to abate the opioid epidemic and the additional costs associated with the expansion in services envisioned in the Plan.

93. It is anticipated that it will take four years to phase in the plan, with costs rising in each year from 2020 through 2023. To illustrate the annual cost of the plan once fully implemented, the first column shows the annual cost in year 5 of the plan (2024). Annual costs for the elements of the Abatement Plan evaluated to date are estimated to be \$312 million in Cuyahoga and \$137 million in Summit in 2024.⁵¹

94. The base case reflects the Experts' view that 2024 level of treatment will be needed for at least another 10 years after that date. I understand that the Expert Report of Anna Lembke explains that the current and future stock of people who have experienced OUD will lead to recurring treatment needs in the future both because some individuals will need to receive treatment for many years and because others will relapse and require renewed treatment. Thus,

⁵¹ Annual costs for each year from 2020 through 2034 are provided in the accompanying detailed tables.

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any decline in treatment needs from a decline in new OUD cases will be offset by greater needs associated with the growing stock of people with continuing treatment needs.⁵²

Table 1
Summary of Abatement Costs, Cuyahoga County

Summary of Abatement Costs, Eschschaga County							
\$ in millions	Annual Cost:	15-Year Estimate: 2020-2034			Report Section	App D Table	
	Year 5 (2024)	Low	Base	High			
<u>TREATMENT</u>							
[1]	Treatment (Excl. MAT)	\$184.2	\$2,595.0	\$3,003.4	\$3,411.7	VI.C.1	Table C.1
[2]	Medication-Assisted Treatment (MAT)	\$40.3	\$513.6	\$594.0	\$674.5	VI.C.2	Table C.2
[3]	Recruiting PCPs to Provide MAT	\$0.5	\$9.0	\$9.0	\$9.0	VI.C.3	Table C.3
[4]	Connecting Individuals to Services	\$5.8	\$92.0	\$94.5	\$97.1	VI.C.4	Table C.4
[5]	Special Populations: Child Welfare	\$17.6	\$288.6	\$288.6	\$288.6	VI.C.5	Table C.5
[6]	Special Populations: Pregnant Women	\$1.7	\$29.2	\$29.2	\$29.2	VI.C.6	Table C.6
[7]	Special Populations: Jails	\$13.7	\$222.0	\$222.0	\$222.0	VI.C.7	Table C.7
<u>HARM REDUCTION</u>							
[8]	Naloxone	\$5.0	\$78.5	\$85.2	\$91.9	VI.D.1	Table C.8
[9]	Syringe Exchange Programs	\$0.7	\$10.9	\$11.3	\$11.8	VI.D.2	Table C.9
[10]	HIV/Hep C Interventions	\$13.8	\$205.9	\$205.9	\$205.9	VI.D.3	Table C.10
[11]	Social Support Housing	\$4.8	\$77.0	\$77.0	\$77.0	VI.D.4	Table C.11
<u>PREVENTION</u>							
[12]	Media Campaign	\$1.2	\$18.5	\$18.5	\$18.5	VI.E.1	Table C.12
[13]	School-Based Prevention	\$16.1	\$264.0	\$264.0	\$264.0	VI.E.2	Table C.13
[14]	Medical Provider Education	\$0.4	\$6.3	\$6.3	\$6.3	VI.E.3	Table C.14
[15]	Drug Disposal Programs	\$0.4	\$6.1	\$6.1	\$6.1	VI.E.4	Table C.15
[16]	Law Enforcement Interventions	\$4.5	\$74.5	\$74.5	\$74.5	VI.E.5	Table C.16
<u>SYSTEM COORDINATION</u>							
[17]	Tracking Abatement Progress	\$0.4	\$6.7	\$6.7	\$6.7	VI.F.1	Table C.17
[18]	Court System Resources	\$0.3	\$5.0	\$5.0	\$5.0	VI.F.2	Table C.18
[19]	Data-Informed Systems Re-Engineering & Mgmt	\$0.8	\$13.9	\$13.9	\$13.9	VI.F.3	Table C.19
ABATEMENT COST, TOTAL		\$312.2	\$4,516.6	\$5,015.2	\$5,513.7		

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Table 2
Summary of Abatement Costs, Summit County

Summary of Abatement Costs, Summit County							
\$ in millions	Annual Cost:	15-Year Estimate: 2020-2034			Report Section	App D Table	
	Year 5 (2024)	Low	Base	High			
<u>TREATMENT</u>							
[1]	Treatment (Excl. MAT)	\$80.5	\$1,136.1	\$1,313.1	\$1,490.1	VI.C.1	Table S.1
[2]	Medication-Assisted Treatment (MAT)	\$17.5	\$222.7	\$257.5	\$292.4	VI.C.2	Table S.2
[3]	Recruiting PCPs to Provide MAT	\$0.3	\$4.5	\$4.5	\$4.5	VI.C.3	Table S.3
[4]	Connecting Individuals to Services	\$2.9	\$45.8	\$47.0	\$48.2	VI.C.4	Table S.4
[5]	Special Populations: Child Welfare	\$13.2	\$216.8	\$216.8	\$216.8	VI.C.5	Table S.5
[6]	Special Populations: Pregnant Women	\$0.9	\$15.1	\$15.1	\$15.1	VI.C.6	Table S.6
[7]	Special Populations: Jails	\$5.2	\$84.0	\$84.0	\$84.0	VI.C.7	Table S.7
<u>HARM REDUCTION</u>							
[8]	Naloxone	\$2.3	\$36.2	\$39.1	\$42.0	VI.D.1	Table S.8
[9]	Syringe Exchange Programs	\$0.5	\$7.1	\$7.4	\$7.7	VI.D.2	Table S.9
[10]	HIV/Hep C Interventions	\$2.7	\$40.2	\$40.2	\$40.2	VI.D.3	Table S.10
[11]	Social Support Housing	\$1.5	\$24.0	\$24.0	\$24.0	VI.D.4	Table S.11
<u>PREVENTION</u>							
[12]	Media Campaign	\$0.5	\$8.1	\$8.1	\$8.1	VI.E.1	Table S.12
[13]	School-Based Prevention	\$7.0	\$114.0	\$114.0	\$114.0	VI.E.2	Table S.13
[14]	Medical Provider Education	\$0.1	\$1.8	\$1.8	\$1.8	VI.E.3	Table S.14
[15]	Drug Disposal Programs	\$0.2	\$3.7	\$3.7	\$3.7	VI.E.4	Table S.15
[16]	Law Enforcement Interventions	\$0.9	\$14.6	\$14.6	\$14.6	VI.E.5	Table S.16
<u>SYSTEM COORDINATION</u>							
[17]	Tracking Abatement Progress	\$0.2	\$3.2	\$3.2	\$3.2	VI.F.1	Table S.17
[18]	Court System Resources	\$0.3	\$5.0	\$5.0	\$5.0	VI.F.2	Table S.18
[19]	Data-Informed Systems Re-Engineering & Mgmt	\$0.8	\$13.9	\$13.9	\$13.9	VI.F.3	Table S.19
ABATEMENT COST, TOTAL		\$137.4	\$1,996.9	\$2,213.2	\$2,429.4		

95. There is, however, uncertainty about the extent of future treatment needs. For example, the Abatement Plan assumes that 1.4 percent of the adult population in each community has opioid use disorder, based on an estimate reported by Pitt et al. Pitt et al. adjust NSDUH estimate of the OUD population upward by roughly 70 percent to correct for underreporting and for populations like the homeless and incarcerated who are not included in the NSDUH sampling frame.⁵³ This adjustment may be conservative based on a 2018

⁵² The resource needs for some components of the Abatement Plan are assumed to decline over time. For example, as more individuals receive MAT, the plan envisions a decline in overdoses and reduced need to replace first responder supplies of naloxone.

⁵³ Pitt, Allison L., Keith Humphreys and Margaret L. Brandeau. "Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic." *AJPH Open Themed Research* Vol. 108 no. 10 (Oct 2018): 1394-1400, at Supplement pp. S3-S4.

Massachusetts study which estimates that the number of people with OUD could be more than four times the NSDUH estimate.⁵⁴ Moreover, it eventually may be possible to recruit more than 40 percent of the OUD population into treatment. For both of these reasons, treatment costs could be higher than in the base case. Alternatively, it is possible that changes in prescribing practices and other prevention efforts will reduce the flow of new OUD cases faster than currently anticipated and that treatment costs will therefore be lower than in the base case.

96. To illustrate the sensitivity of the base case estimates to alternative assumptions about future treatment needs, Tables 1 and 2 present “high” and “low” estimates in addition to the base case.⁵⁵ The high estimate assumes that treatment needs increase over ten years to 1.33 times the 2024 level. The low estimate assumes treatment needs decline over ten years to two-thirds of the 2024 level. In Cuyahoga, the 15-year costs for the elements of the Abatement Plan evaluated to date range from \$4.5 billion to \$5.5 billion. In Summit, the 15-year costs range from \$2.0 billion to \$2.4 billion.

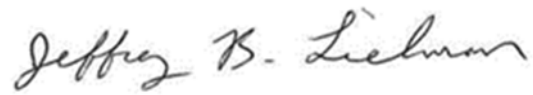
97. The Abatement Plan described in this report reflects the information available to me at the time of its writing and my best judgment about the needs in the two communities. When it becomes time to implement the actual Plan, it will be important to update the Plan based upon the latest information and conditions on the ground in Cuyahoga and Summit and to have a more intensive process of engaging community members and local experts so as to ensure the most effective possible implementation of the Abatement Plan for the Cuyahoga and Summit Communities.

⁵⁴ Barocas, et al, “Estimated Prevalence of Opioid Use Disorder in Massachusetts, 2011-2015: A Capture-Recapture Analysis.” *American Journal of Public Health*, 2018, 108:12, 1675-1681.

⁵⁵ In addition to the treatment variations described here, low and high case estimates are also presented in Tables C.8 and S.8 (naloxone) and C.9 and S.9 (syringe exchange programs).

Confidential

April 3, 2019

A handwritten signature in cursive script that reads "Jeffrey B. Liebman".

Jeffrey B. Liebman

March 2019

JEFFREY B. LIEBMAN**Address:**

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Current Positions:

Malcolm Wiener Professor of Public Policy, Kennedy School of Government, Harvard University, 2006-present.
 Director, Taubman Center for State and Local Government, 2015-present.
 Director, Rappaport Institute for Greater Boston, 2015-present.
 Founder and Director, Harvard Kennedy School Government Performance Lab, 2011-present.
 Research Associate, National Bureau of Economic Research, 2005-present.
 Co-organizer, NBER Working Group on Social Security.
 Associate Director, NBER Retirement Research Center and NBER Disability Research Center, 2011-2015.

Previous Positions:

Acting Deputy Director, Office of Management and Budget, 2010.
 Executive Associate Director and Chief Economist, Office of Management and Budget, 2009.
 Special Assistant to the President for Economic Policy, White House National Economic Council, 1998-1999.
 Assistant Professor of Public Policy, Kennedy School of Government, Harvard University, 1996-2001.
 Associate Professor of Public Policy, Kennedy School of Government, Harvard University, 2001-2005.
 Professor of Public Policy, Kennedy School of Government, Harvard University, 2005-2006.
 Faculty Research Fellow, National Bureau of Economic Research, 1996-2005.
 Harvard Kennedy School Area Chair for Social Policy, 2005-2007.
 Director, Harvard University Multidisciplinary Program in Inequality and Social Policy, 2005-2007.

Education:

Ph.D., Economics, 1996	Harvard University
B.A. <i>magna cum laude</i> , distinction in Economics and Political Science, 1989	Yale University

Honors and Fellowships:

Elected to National Academy of Social Insurance, 2002.
 NBER Center for Aging, Demography Research Fellow, 2001-2002.
 Alfred P. Sloan Foundation Doctoral Dissertation Fellowship, 1995-1996.
 Tinker Foundation Fellowship for research in Mexico, summer 1992.
 National Science Foundation Graduate Fellowship, 1991-1994.
 Yale University, Ronald Meltzer Economics Award for the outstanding senior essay in major, 1989.

Research Grants:

Bloomberg Philanthropies grant to fund Government Performance Lab work on results-driven contracting, 2015-2021.
 John and Laura Arnold Foundation grants to fund Government Performance Lab 2013-2020.

Rockefeller Foundation grant to expand Social Impact Bond Technical Assistance Lab, 2012-2015.
 Dunham Fund grant to expand Social Impact Bond Technical Assistance Lab, 2013-2015.
 Smith Richardson Foundation grant for "Building an Evidence Base for Disability Insurance Reform" (with Jack Smalligan), 2012-2013.
 Rockefeller Foundation grant to establish a "Social Impact Bond Technical Assistance Lab," 2011-2013.
 National Institutes of Health (NIA), "Building Integrated Models of Retirement: Three Approaches," 2007-2012.
 NBER-SSA Retirement Research Center grant for "The Taxation of Social Security Benefits as an Approach to Means Testing," 2007-2008.
 NBER-SSA Retirement Research Center grant for "The Perception of Social Security Incentives for Labor Supply and Retirement" (with Erzo Luttmer), 2007-2008.
 NBER-SSA Retirement Research Center grant for "Labor Supply Responses to the Social Security Tax-Benefit Link" (with Erzo Luttmer), 2006-2007.
 NBER-SSA Retirement Research Center grant for "How Should Changes in Population Health Affect Retirement Ages?" (with David Cutler), 2006-2007.
 NBER-SSA Retirement Research Center grant for "Could Social Security Eliminate Poverty Among the Elderly?", 2005-2006.
 NBER-SSA Retirement Research Center grant for "Earnings Responses to Raising the Social Security Taxable Maximum?" (with Emmanuel Saez), 2004-2005.
 NBER-SSA Retirement Research Center grant for "How Fast Should the Social Security Retirement Age Rise?" (with David Cutler), 2003-2004.
 National Institutes of Health (NIA) First Award for "Protecting the Poor While Reforming Social Security," 1999-2004.
 Russell Sage Foundation Grant for "Reforming Tax and Transfer Programs in Order to Assist Low-skilled Workers," 1997-2000.
 National Institute of Child Health and Human Development grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2001-2004.
 Russell Sage Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2000-2006.
 Smith Richardson Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2000-2003.
 William T. Grant Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2001-2004.
 MacArthur Foundation grant for "Moving to Opportunity and Family Well-being" (with Lawrence Katz, Jeffrey Kling, Jeanne Brooks-Gunn, and Greg Duncan), 2001-2002.
 Robert Wood Johnson Foundation grant for "Moving to Opportunity and Family Well-being" (with Lawrence Katz, Jeffrey Kling, Jeanne Brooks-Gunn, and Greg Duncan), 2001-2002.
 U.S. Department of Housing and Urban Development grant for "Expanding Moving to Opportunity Research" (with Lawrence Katz and Jeffrey Kling), 2000-2006.
 US Department of Housing and Urban Development grant, 1995-2000, for "Moving to Opportunity in Boston" (with Lawrence Katz and Jeffrey Kling).
 NBER-NIA Center for Aging and Health Research grant for "Health Outcomes in MTO" (with Lawrence Katz and Jeffrey Kling), 1997-1998.

Journal Articles and Book Chapters:

Research on Housing Policy and Neighborhood Effects

1. "Moving to Opportunity in Boston: Early Outcomes of a Housing Mobility Program" (with Lawrence Katz and Jeffrey Kling), *Quarterly Journal of Economics*, May 2001.

2. "Boston Site Findings: The Early Impacts of Moving to Opportunity" (with Lawrence Katz and Jeffrey Kling), in *Choosing a Better Life? Evaluating the Moving to Opportunity Social Experiment*, edited by John M. Goering and Judith D. Feins (Washington: Urban Institute Press), 2003.
3. "Bullets Don't Got No Name: Consequences of Fear in the Ghetto" (with Lawrence Katz and Jeffrey Kling), in *Discovering Successful Pathways in Children's Development: New Methods in the Study of Childhood and Family Life*, edited by Thomas S. Weisner (Chicago: University of Chicago Press), 2004.
4. "Experimental Analysis of Neighborhood Effects" (with Jeffrey Kling and Lawrence Katz), *Econometrica*, January 2007.
5. "What Can We Learn About Neighborhood Effects from the Moving to Opportunity Experiment?" (with Jens Ludwig, Jeffrey Kling, Greg Duncan, Larry Katz, Ronald Kessler, and Lisa Sanbonmatsu), *American Journal of Sociology*, 114, July 2008.

Research on Executive Compensation

5. "Are CEOs Really Paid Like Bureaucrats?" (with Brian Hall), *Quarterly Journal of Economics*, August 1998.
6. "Taxation and Executive Compensation" (with Brian Hall), *Tax Policy and the Economy*, 14, 2000.

Research on the Earned Income Tax Credit

7. "Labor Supply Response to the Earned Income Tax Credit" (with Nada Eissa), *Quarterly Journal of Economics*, May 1996. Reprinted in Alan Auerbach, editor, *Public Finance*, Worth Series in Outstanding Contributions, 2000.
8. "The Impact of the Earned Income Tax Credit on Incentives and Income Distribution," *Tax Policy and the Economy*, 12, 1998.
9. "Who are the Ineligible Earned Income Tax Credit Recipients?" *National Tax Journal*, December 2000.
10. "The Optimal Design of the Earned Income Tax Credit," in *Making Work Pay: The Earned Income Tax Credit and Its Impact on American Families*, edited by Bruce D. Meyer and Douglas Holtz-Eakin (New York: Russell Sage Foundation Press), 2002.
11. "The EITC Abroad: Implications of the British WFTC for Pay-as-you-earn Administration of the EITC," (with Janet Holtzblatt), *Proceedings of the National Tax Association*, 1999.
12. "Would People Behave Differently If They Better Understood Social Security? Evidence from a Field Experiment" (with Erzo Luttmer), *American Economic Journal: Economic Policy*, 7(1), 2015.

Research on Social Security and Social Security Reform

13. "The Perception of Social Security Incentives for Labor Supply and Retirement: The Median Voter Knows More than You'd Think" (with Erzo Luttmer), *Tax Policy and the Economy*, 26, 2012.
14. "Labor Supply Responses to Marginal Social Security Benefits: Evidence from Discontinuities" (with Erzo Luttmer and David Seif), *Journal of Public Economics*, 93, December 2009.
15. "Redistribution in the Current U.S. Social Security System," in *The Distributional Aspects of Social Security and Social Security Reform*, edited by Martin Feldstein and Jeffrey B. Liebman (Chicago: University of Chicago Press), 2002.
16. "The Distributional Effects of an Investment-based Social Security System" (with Martin Feldstein), in *The Distributional Aspects of Social Security and Social Security Reform*, edited by Martin Feldstein and Jeffrey B. Liebman (Chicago: University of Chicago Press), 2002.
17. "Social Security" (with Martin Feldstein), in *Handbook of Public Economics*, edited by Alan J. Auerbach and Martin Feldstein (Amsterdam: Elsevier), volume 4, 2002.

Research on Tax and Budget Policy

18. "Independent Taxation, Horizontal Equity, and Return-Free Filing" (With Daniel Ramsey), *Tax Policy and the Economy* 33, forthcoming 2019.
19. "Do Expiring Budgets Lead to Wasteful Year-End Spending? Evidence from Federal Procurement" (with Neale Mahoney), *American Economic Review*, 107(11), 2017.
20. "Social Security and National Saving in an Era of Budget Surpluses" (with Douglas Elmendorf), *Brookings Papers on Economic Activity*, 2, 2000.
21. "The Middle Class Parent Penalty: Child Benefits in the U.S. Tax Code" (with David Ellwood), *Tax Policy and the Economy*, 15, 2001.
22. "Fiscal Policy and Social Security Policy During the 1990s" (with Douglas Elmendorf and David Wilcox), in *American Economic Policy in the 1990s*, edited by Jeffrey Frankel and Peter Orszag (Cambridge: MIT Press), 2002.
23. "Saving Incentives for Low- and Middle-income Families: Evidence from a Field Experiment with H&R Block (with Esther Duflo, William Gale, Peter Orszag, and Emmanuel Saez), *Quarterly Journal of Economics*, November 2006.
24. "Simple Humans, Complex Insurance, Subtle Subsidies" (with Richard Zeckhauser), in *Using Taxes to Reform Health Insurance: Pitfalls and Promises*, edited by Henry Aaron and Leonard Burman (Washington, Brookings Institution), 2008.
25. "The Deterioration in the U.S. Fiscal Outlook, 2001–2010," *Tax Policy and the Economy*, 27, 2013.
26. "The Decline, Rebound, and Further Rise in SNAP Enrollment: Disentangling Business Cycle Fluctuations and Policy Changes" (with Peter Ganong), *American Economic Journal: Economic Policy*, 10:4, 2018.

Working Papers:

27. "How Fast Should the Social Security Eligibility Age Rise?" (with David Cutler, Seamus Smyth, and Mark Shepard).
28. "Earnings Responses to Increases in Payroll Taxes" (with Emmanuel Saez).
29. "Schmeduling" (with Richard Zeckhauser).

Books Edited:

Distributional Aspects of Social Security and Social Security Reform (with Martin Feldstein), (Chicago: University of Chicago Press), 2002.

Social Security Policy in a Changing Environment (with David Wise and Jeffrey Brown), (Chicago: University of Chicago Press), 2009.

Other Writings:

"How Cities Can Improve Their Procurement of Goods and Services" (With Hanna Azemati), in *Retooling Metropolis*, Manhattan Institute, 2016.

Social Impact Bonds: A Guide for State and Local Governments (with Alina Sellman), Harvard SIB Lab, June 2013.

Building on Recent Advances in Evidence-Based Policymaking, Brookings Hamilton Project and America Achieves, April 2013.

"An Evidence-Based Path to Disability Insurance Reform" (with Jack Smalligan) in *15 Ways to Rethink the Federal Budget*, Brookings Hamilton Project, February 2013.

"Social Impact Bonds: Lessons Learned So Far" (with SIB Lab team) in *Community Development Investment Review*, Federal Reserve Bank of San Francisco, February 2013.

"The Baby Boom Bump" (with Kenneth Baer), *New York Times*, December 6, 2012.

"The End of Health Insurance Companies" (with Ezekiel Emanuel), *New York Times Opinionator*, January 30, 2012.

"Cut Medicare, Help Patients" (with Ezekiel Emanuel), *New York Times*, August 22, 2011.

Social Impact Bonds: A Promising New Financing Model to Accelerate Social Innovation and Improve Government Performance, Center for American Progress, February 2011.

"Social Security Meets Race," *Science*, September 23, 2005, p. 1965.

"Reforming Social Security: Not All Privatization Schemes Are Created Equal." *Harvard Magazine*, March-April, 2005.

Moving to Opportunity: Interim Impacts Evaluation (with Larry Orr, Judith Feins, Robin Jacob, Erik Beecroft, Lisa

Sanbonmatsu, Jeffrey Kling, and Lawrence Katz). Washington D.C.: U.S. Department of Housing and Urban Development, 2003.

The Role of Annuities in a Reformed U.S. Social Security System. December 2002. AARP Public Policy Institute report 2002-17.

“Is Social Security Unfair to the Poor?” Op-ed, *Washington Post*, July 29, 2001.

“Personal Accounts and Social Security,” Letter to the Editor, *Washington Post*, July 9, 2001.

“The Earned Income Tax Credit.” Testimony provided to the Committee on Finance, United States Senate, Washington, D.C., March 7, 2001.

“The EITC Compliance Problem,” *Poverty Research News*, Summer 1998, Joint Center for Poverty Research.

“Tax Credit Combines Best of Two Systems,” Op-ed, *Financial Times*, March 17, 1998.

“Blair Could Learn From US Tax Credit Scheme,” Letter to the Editor, *Financial Times*, June 23, 1997.

Lessons About Tax-benefit Integration from the US Earned Income Tax Credit Experience. Joseph Rowntree Foundation. York, England. 1997.

Teaching:

Public Economics (PhD field course), Harvard Economics Department. 2006, 2007, 2008, 2011.

Economic Analysis of Public Policy (public finance), Harvard Kennedy School. 1997, 2000, 2001, 2003, 2004, 2005, 2008, 2011, 2012, 2014, 2015, 2016, 2017, 2018, 2019.

Government Turnarounds, Harvard Kennedy School. 2017, 2018.

Empirical Methods II (regression analysis and program evaluation), Harvard Kennedy School. 1997, 1998.

Tax and Budget Policy, Harvard Kennedy School. 2000.

Doctoral Research Seminar, Harvard Kennedy School. 2000, 2001.

American Economic Policy, Harvard Economics Department (undergraduate) and Harvard Kennedy School. 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018.

New Members of Congress Program (presentations on Social Security and Medicare and economic outlook). 2000, 2002, 2012.

Proseminar on Inequality and Social Policy (PhD students), Harvard Department of Sociology and Harvard Kennedy School. 2005, 2007, 2010.

Appendix B - Materials Considered

Date	Author(s)	Title	Source
Nov. 7, 2018	Cuyahoga County Medical Examiner's Office	Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County: 2018 October Update	http://medicalexaminer.cuyahogacounty.us/pdf_medicalexaminer/en-US/HeroinFentanylReports/110718-HeroinFentanylReport.pdf
Oct. 1, 2018	Summit County Public Health	Population Health Vital Statistics Brief: Vol. 3: Drug Overdoses, Oct 1-30, 2018	https://www.scph.org/sites/default/files/editor/drug%20overdoses%20data%20brief%20Oct.%202018.pdf
Dec. 17, 2018	Summit County ADM Board	Summit County Opiate Task Force Quarterly Dashboard	SUMMIT_002053851
Apr. 2, 2015	Scott Wexelblatt, Susan Ford	Maternal Fetal Issues for Physicians: Optimal Care for Infants with neonatal abstinence syndrome, Presentation to the National RX Drug Abuse Summit	https://www.slideshare.net/OPUNITE/rx15-clinical-wed4301wexelblattford2warnerroussosross
6-Jun-17	Max Blau	STAT forecast: Opioids could kill nearly 500,000 Americans in the next decade	STAT, https://www.statnews.com/2017/06/27/opioid-deaths-forecast
2016	Cuyahoga County Board of Health	Cuyahoga County Opiate Task Force Report: 2016	CUYAH_000018265
25-Jun-18	Summit County ADM Board	Summit County Opiate Task Force Meeting	https://www.summitcountyaddictionhelp.org/Data/Sites/19/attachments/otf-stakeholders-mtg-notes-06182018-final.pdf
Aug. 23, 2018	Allison Pitt, Keith Humphreys, Margaret Brandeau	Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic	American Journal of Public Health. October 2018, Vol 108, No. 10: 1394-1400 and Supplement
31-Jul-17	John Brooklyn and Stacey Sigmon	Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact	Journal of Addiction Medicine, Volume 11, Number 4, July/Aug. 2017
Dec. 2018	Yamilette Hernandez et al.	How Massachusetts, Vermont, and New York are Taking Action to Address the Opioid Epidemic	American Journal of Public Health, 108(12), pp. 1621-1622
	American Society of Addiction Medicine	ASAM Patient Placement Criteria	https://www.asam.org/resources/the-asam-criteria/about
Oct. 2, 2018	Emma Sandoe, Carrie E. Fry, Richard G. Frank	Policy Levers That States Can Use To improve Opioid Addiction Treatment And Address The Opioid Epidemic	Health Affairs Blog, https://www.healthaffairs.org/do/10.1377/hblog20180927.51221/full/
Jan. 8, 2013	Carlos Blanco et al.	Probability and predictors of treatment-seeking for prescription opioid use disorders: A National Study	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3636152/
		SAMHSA web site	https://www.samhsa.gov
Dec. 1, 2018	Joshua A. Barocas et al.	Estimated Prevalence of Opioid Use Disorder in Massachusetts, 2011-2015: A Capture-Recapture Analysis	American Journal of Public Health 108, no. 12 (December 1, 2018): pp. 1675-1681
	Ohio Department of Mental Health and Addiction Services	Workforce development as Part of the 21st Century Cures Act	
Sept. 14, 2015	Todd Molfenter et al.	Buprenorphine Prescribing Availability in a Sample of Ohio Specialty Treatment Organizations	Journal of Addictive Behaviors, Therapy & Rehabilitation, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4569134/pdf/nihms701827.pdf

Date	Author(s)	Title	Source
24-Jul-18	Monica Robbins	Local Health Experts Point to Syringe Exchange Program for drop in HIV cases among drug users	https://www.wkyc.com/article/news/health/local-health-experts-point-to-syringe-exchange-program-for-drop-in-hiv-cases-among-drug-users/95-577131339
8-Jun-18	National Institute on Drug Abuse	Heroin: Why does heroin use create special risk for contracting HIV/AIDS and hepatitis B and C?	https://www.drugabuse.gov/publications/research-reports/heroin/why-are-heroin-users-special-risk-contracting-hivaids-hepatitis-b-c
	Blueprints for Healthy Youth Development	Project Towards No Drug Abuse: Detailed Evaluation Abstract	https://www.blueprintsprograms.org/evaluation-abstract/project-towards-no-drug-abuse
	Blueprints for Healthy Youth Development	Life Skill Trainings (LST): Detailed Evaluation Abstract	https://www.blueprintsprograms.org/evaluation-abstract/lifeskills-training-lst
Sept. 28, 2018	Barry Meisenberg, Jennifer Grover, Colson Campbell, Daniel Korpon	Assessment of Opioid Prescribing Practices Before and After Implementation of a Health System Intervention to Reduce Opioid Overprescribing	JAMA Network Open. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2703950
Mar. 25, 2011	Dieter Henkel	Unemployment and Substance Use: A Review of the Literature (1990-2010)	Current Drug Abuse Reviews 4(1):4-27. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4601938/
Jan. 3, 2017	Joseph Boden et al.	Modelling possible causality in the associations between unemployment, cannabis use, and alcohol misuse	Social Science & Medicine, vol. 175. https://www.researchgate.net/publication/312274077_Modeling_possible_causality_in_the_associations_between_unemployment_cannabis_use_and_alcohol_misuse
	Bureau of Labor Statistics	2017 unemployment rates in Cleveland, Summit and Cuyahoga	https://www.bls.gov/lau/lacilg17.htm
2001	Barnett PG, Zaric GS, Brandeau ML	The cost-effectiveness of buprenorphine maintenance therapy for opiate addiction in the United States.	Addiction
2014	Cicero TJ, Ellis MS, Surratt HL, Kurtz SP	The changing face of heroin use in the United States: a retrospective analysis of the past 50 years	JAMA Psychiatry. 2014;71(7):821-826
2013	Coffin PO, Sullivan SD	Cost-effectiveness of distributing naloxone to heroin users for lay overdose reversal	Annals of Internal Medicine, 2013;158(1):1-9.
2008	Fishbain DA et al.	What percentage of chronic nonmalignant pain patients exposed to chronic opioid analgesic therapy develop abuse/addiction and/or aberrant drug-related behaviors? A structured evidence-based review.	Pain Medicine 2008 May-Jun;9(4):444-59
20-May-16	Goodnough A, Tavernise S	Opioid Prescriptions Drop for First Time in Two Decades	New York Times. https://www.nytimes.com/2016/05/21/health/opioid-prescriptions-drop-for-first-time-in-two-decades.html
2017	Hser Y-I, Mooney LJ, Saxon AJ, Miotto K, Bell DS, Huang D	Chronic pain among patients with opioid use disorder: results from electronic health records data	J Subst Abuse Treat. 2017;77:26-30.
2016	Kochanek KD, Smith M, Xu JQ, Tejada-Vera B	Deaths: Final data for 2014	Natl Vital Stat Rep. 2016;65(4):1-122.

Date	Author(s)	Title	Source
2013	Muhuri PK, Gfroerer JC, Davies MC	Associations of nonmedical pain reliever use and initiation of heroin use in the United States. Center for Behavioral Health Statistics and Quality Data Review 2013	http://www.samhsa.gov/data/sites/default/files/DR006/DR006/nonmedical-pain-relieveruse-2013.htm
2016	Schuckit MA	Treatment of opioid-use disorders	N Engl J Med. 2016;375(4):357-368.
2016	US Census Bureau	Annual estimates of the resident population by single year of age and sex for the United States: Apr. 1, 2010 to July 1, 2015.	https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk
2015	Vowles KE et al.	Rates of opioid misuse, abuse, and addiction in chronic pain: a systematic review and data synthesis.	Pain. 2015;156(4):569-576
2016	Xu JQ, Murphy SL, Kochanek KD, Bastian BA	Deaths: final data for 2013	Natl Vital Stat Rep. 2016;64(2):1-119
13-Jun-18	Margaret Baughman and Mark Singer	Ohio MHAS Addiction Treatment Pilot Program Final Report Dec. 2015	
26-Oct-17	Rosalie Liccardo Pacula	Estimating the costs of substitution therapy for heroin and opioid addiction in the United States: Insights and challenges	Rand Drug Policy Research Center - Lisbon Addiction Conference
13-Jul-17	Rachel N. Lipari, Struther L. Can Horn, Arthur Hughes and Matthew Williams	State and Substate Estimates of Nonmedical Use of Prescription Pain Relievers	Substance Abuse and Mental Health Services Administration (SAMHSA), The CBHSQ Report
6-Jul-18	Summit County Opiate Task Force	Summit County Opiate Task Force Quarterly Stakeholder Meeting Presentation	
7-Jul-18	Summit County Public Health	Summit County Public Health Strategic Plan: 2017-2019 (Revised Jan. 2018)	
8-Jul-18	Ohio Department of Higher Education	Substance Abuse Prevention Education	
8-Jul-18	Substance Abuse and Mental Health Services Administration (SAMHSA)	Medications for Opioid Use Disorder for Healthcare and Addiction Professionals, Policymakers, Patients and Families	Substance Abuse and Mental Health Services Administration (SAMHSA) 2018
8-Jul-18	Shawn A. Ryan	The Science of Addiction: Overview of Development and Treatment	
17-May-13	Harvard Kennedy School, John F. Kennedy School of Government	Epilogue: The Consolidation of the Health Departments in Summit County, Ohio	
7-Jun-17	Ohio State Finance Committee	Testimony of: Dr. Doug Smith, Medical Director/CCO County of Summit ADM Board	http://search-prod.lis.state.oh.us/cm_pub_api/api/unwrap/chamber/132nd_ga/ready_for_publication/committee_docs/cmte_s_finance_1/testimony/cmte_s_finance_1_2017-06-07-1000_538/dougsmithhb49t60717.pdf

Date	Author(s)	Title	Source
Aug. 29, 2017	Centers for Disease Control	Guidelines for Prescribing Opioids for Chronic Pain - Pocket Guide: Tapering Opioids for Chronic Pain	Centers for Disease Control
	David Gilchrist	Weaning Off Opiates	https://masspaininitiative.org/files/DGilchrist_MassPI_Spring2017.pdf
Nov. 28, 2018	Raj Gupta	Find Local Treatment	The Ohio State University Medical Center For the Ohio State Medical Center, Franklin County
Jan. 4, 2019	Summit County Public Health	Project Narrative - Summit County Public Health Community Medication Assisted Treatment Program	
2018	Summit County Public Health	Summit County Application for Federal Assistance	SUMMIT_001923700
Aug. 2018	Department of Health and Human Services Food and Drug Administration Center for Drug Evaluation and Research (CDER)	Opioid Use Disorder: Endpoints for Demonstrating Effectiveness of Drugs for Medication-Assisted Treatment Guidance for Industry	Department of Health and Human Services Food and Drug Administration Center for Drug Evaluation and Research (CDER)
2017	National Academies of Sciences, Engineering, and Medicine	Pain Management and the Opioid Epidemic: Balancing Societal and Individual Benefits and Risks of Prescription Opioid Use	National Academies Press. https://doi.org/10.17226/24781
	Ohio Development Services Agency	Population Projections: County Totals	https://development.ohio.gov/files/research/P6090.pdf
	U.S. Department of Health and Human Services	National Survey of Substance Abuse Treatment Services (N-SSATS): 2017 Data on Substance Abuse Treatment Facilities	Substance Abuse and Mental Health Services Administration
	Michele Worobiec	Policy, Chapter 5: Court-Based Responses to the Opioid Crisis; Specialized Dockets Supreme Court of Ohio Columbus, Ohio	https://www.ohioabar.org/globalassets/advocacy/opiates-resource-page/5-worobiec.pdf
Sep. 2018	Community Action Akron Summit	Combating the Opioid Epidemic in Summit County, OH: Pathways HUB Community Action	https://communityactionpartnership.com/wp-content/uploads/2018/09/The-Opioid-Crisis-and-Community-Actions-Response_Akron.pdf
Jan. 11, 2018	Cuyahoga County Medical Examiner's Office	Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County: 2018 December Update	http://medicalexaminer.cuyahogacounty.us/pdf_medicalexaminer/en-US/HeroinFentanylReports/011119-HeroinFentanylReport.pdf
Mar. 6, 2019	Cuyahoga County Medical Examiner's Office	Cuyahoga County Medical Examiner's Office - Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2019: February Update	http://medicalexaminer.cuyahogacounty.us/pdf_medicalexaminer/en-US/HeroinFentanylReports/CCMEFeb2019HeroinFentanylCocaine.pdf
Feb. 1, 2019	Cuyahoga County Medical Examiner's Office	Cuyahoga County Medical Examiner's Office - Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2019 Draft January Update	
Mar. 9, 2019	Roger E. Backhouse and Jeff Biddle	The Concept of Applied Economics: A History of Ambiguity and Multiple Meanings	https://read.dukeupress.edu/hope/article-pdf/32/Suppl_1/1/427135/01-Biddlebackhouse.pdf

Date	Author(s)	Title	Source
Nov. 29, 2018	Summit County	Alcohol, Drug Addiction & Mental Health Services Board, Report on Opiate Epidemic Impact	SUMMIT_002053751
Aug. 14, 2018		Deposition Tr. Donna Skoda	
Nov. 28, 2018		Deposition Tr. Shane Barker	
Nov. 15, 2017	Public Children Services Association of Ohio	Best Interests for Abused and Neglected Children: Working Toward Reunification During the Opioid Crisis	http://www.pcsao.org/pdf/advocacy/ReasonableEffortsWhitePaperNov2017.pdf
	Public Children Services Association of Ohio	Ohio's Opiate Epidemic and Child Protection: 2016	SUMMIT_000085306
	Public Children Services Association of Ohio	PCSAO Factbook, 12th Edition 2015-2016	SUMMIT_001874511
	Public Children Services Association of Ohio	PCSAO Factbook, 13th Edition 2016-2017	SUMMIT_001874721
	Public Children Services Association of Ohio	PCSAO Factbook, 13th Edition 2016-2017: Summit County	SUMMIT_001874719
Dec. 2018	Public Children Services Association of Ohio	The Opioid Epidemic's Impact on Children Services in Ohio	SUMMIT_000115686
Sept. 2016	Public Children Services Association of Ohio	The Opioid Epidemic's Impact on Children Services in Ohio	SUMMIT_000105844
Jan. 17, 2019	Summit County	Alcohol, Drug Addiction & Mental Health Services Board, SUD Services	
25-Jun-18	Summit County ADM Board	Summit County Opioid Task Force: Quarterly Stakeholders Meeting	SUMMIT_001472861
20-Jun-18		Summit County and City of Akron, Ohio Plaintiff First Amended Responses and Objections to Distributor Defendants' First Set of Interrogatories	
	Summit County Children Services	Summit County Children Services, 2014 Annual Report: Finding Forever Families	SUMMIT_000003930
	Summit County Children Services	2015 Annual Report: Bring Dads into the Picture	SUMMIT_000003942
	Summit County Children Services	2016 Annual Report: The Challenge of Protecting Children During the Opioid Epidemic	SUMMIT_000003954
	Summit County Children Services	2017 Annual Report: Safety, Permanency, Well-Being. That's what we do ... every day	SUMMIT_002052855
Dec. 27, 2018	Summit County Opiate & Addiction Task Force	2018 Highlights	SUMMIT_002053857
Dec. 27, 2018	Summit County Opiate & Addiction Task Force	2019 Meeting Calendar	SUMMIT_002053885
Dec. 17, 2018	Summit County Opiate & Addiction Task Force	Public Quarterly Meeting Agenda	

Date	Author(s)	Title	Source
Dec. 17, 2018	Summit County Opiate & Addiction Task Force	Public Quarterly Meeting: 4th Quarter – Year End	SUMMIT_002053822
2018	Summit County Public Health	Population Health Vital Statistics Brief: Vol. 3: Drug Overdoses, Apr. 1 – Apr. 30, 2018	SUMMIT_000027084
Oct. 2017	Mark Rembert et al.	Taking Measure of Ohio's Opioid Crisis	C. William Swank Program in Rural-Urban Policy
	Summit County Public Health	Population Health Vital Statistics Brief: Vol. 3: Drug Overdoses, Jan 1 – Nov 30, 2016	SUMMIT_000037338
	Summit County Public Health	Population Health Vital Statistics Brief: Vol. 3: Drug Overdoses, Jan 1 – Nov 30, 2017	SCGHD_000001051
	Summit County	Critical Intervention Points for Change: Summit County	SUMMIT_000027115
25-Jun-18	Summit County	Historical Revenues and Expenditures: Alcohol, Drug & Mental Health	SUMMIT_000111606
25-Jun-18	Summit County	Historical Revenues and Expenditures: Common Pleas	SUMMIT_000111607
25-Jun-18	Summit County	Historical Revenues and Expenditures: Children Services Board	SUMMIT_000111608
25-Jun-18	Summit County	Historical Revenues and Expenditures: Executive	SUMMIT_000111609
25-Jun-18	Summit County	Historical Revenues and Expenditures: Job and Family Services	SUMMIT_000111610
25-Jun-18	Summit County	Historical Revenues and Expenditures: Medical Examiner Lab Fund	SUMMIT_000111611
25-Jun-18	Summit County	Historical Revenues and Expenditures: Medical Examiner	SUMMIT_000111612
25-Jun-18	Summit County	Historical Revenues and Expenditures: Prosecutor	SUMMIT_000111613
25-Jun-18	Summit County	Historical Revenues and Expenditures: Sheriff	SUMMIT_000111614
25-Jun-18	Summit County	Historical Revenues and Expenditures: Veteran's Service Commission	SUMMIT_000111615
Mar. 20, 2018	Summit County	Sequential Intercept Mapping and Action Planning for Opioid Epidemic Response	SUMMIT_000349556
2017	Waite, K., Deeken, A., Perch, S., & Kohler, L. J	Carfentanil and Current Opioid Trends in Summit County, Ohio	Academic Forensic Pathology, 7(4), 632–639, SUMMIT_000031143
Nov. 19, 2018		Deposition Tr. Molly Leckler	
Dec. 19, 1996	Antonnette Graham, Norman Graham, et al.	Miracle Village: A Recovery Community for Addicted Women and Their Children in Public Housing	Journal of Substance Abuse Treatment, Vol. 14, No.3 pp.275-284, 1997 (accessed at https://www.journalofsubstanceabusereatment.com/article/S0740-5472(97)00007-X/fulltext)
	Cuyahoga County Sherriff's Dept.	Cuyahoga County Corrections Center (CCCC) End of Year Report, 2017	CUYAH_000097408
		Calendar Year 2018 Funding Recommendations by Provider,	CUYAH_001350090
9-May-17	Cuyahoga County Medical Examiner's Office	Cost of Heroin/Fentanyl Crisis, Fiscal Impacts to CCMEO Operations Update	CUYAH_001629584

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20-Jun-17	The Ohio Perinatal Quality Collaborative	Updates/Changes to the recommended OPQC NAS Protocol	https://opqc.net/sites/bmidrupalpopqc.chmcres.cchmc.org/files/NAS/OPQC%20Recommended%20NAS%20Protocol%20Changes%202017.pdf
Sep. 10, 2018	Cuyahoga County ADAMHS Board	A Leader in Combatting the Opioid Crisis in Cuyahoga County Update	http://adamhsc.org/pdf_adamhsc/en-US/(no%20numbers%20version%20for%20website)%20ADAMHS%20A%20Leader%20in%20Combating%20the%20Heroin%20Crisis%20UPDATE%20September.pdf
	Cuyahoga County ADAMHS Board	Provider Network Guide 2018	www.adamhsc.org
	Summit County	SCCS 2017 Budget	SUMMIT_001128330
	Summit County	SCCS 2018 Budget	SUMMIT_000990286
	Summit County	2017 Summit Medical Examiner Annual Report	SUMMIT_000022439
	Summit County	Cost Narrative	SUMMIT_000028305
	Summit County	2017 ADM Budget Review	SUMMIT_00017955
	City of Akron	Akron Opiate Incidents.xlsx	AKRON_000004036
	Cuyahoga County Sheriff's Dept.	Jail.xls	CUYAH_012341077
	Cuyahoga County	CCMEO 2006-2017 overdose data.xlsx	CUYAH_000099975
	Cuyahoga County	FTEs by Division.xls	CUYAH_001714366
	Cuyahoga County	Copy of payroll agency numbers2.xlsx	CUYAH_002426281
	Cuyahoga County	EE 2013 - 6 agencies.xlsx	CUYAH_002426282
	Cuyahoga County	EE 2014 - 6 agencies.xlsx	CUYAH_002426283
	Cuyahoga County	EE 2015 - 6 agencies.xlsx	CUYAH_002426284
	Cuyahoga County	EE 2016 - 6 agencies.xlsx	CUYAH_002426285
	Cuyahoga County	EE 2017 - 6 agencies.xlsx	CUYAH_002426286
	Cuyahoga County	pub11.xlsx	CUYAH_002426287
	Cuyahoga County	pub12.xlsx	CUYAH_002426288
	Cuyahoga County	Total Expenditures - 2006-2017 - by subobject.xls	CUYAH_000018178
	City of Cleveland	Purchases of Naloxone and Mucosal Atomization	CLEVE_001627553
	City of Cleveland	Opioid Overdose Chart	CLEVE_000010988
	City of Cleveland	Narcan Administered Summary 2016-May 16 2018.docx	CLEVE_000248973
	City of Cleveland	2018 Budget Book	CLEVE_000010463
Nov. 13, 2018		C. Weiskittel Deposition Tr.	
Nov. 20, 2018		G. Gingell Deposition Tr.	
	U.S. DOD, Office of the Secretary	32 CFR Part 199. TRICARE; Mental Health and Substance Use Disorder Treatment.	Federal Register, Vol. 81, No. 171, 61068-61098
15-Jul-15	Noam Kirson, Amie Shei, J. Bradford Rice	The Burden of Undiagnosed Opioid Abuse Among Commercially Insured Individuals	Pain Medicine 2015; 16: 1325-1332 https://academic.oup.com/painmedicine/article/16/7/1325/1917718

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1-Jul-14	Edwinah Atusingwize, Sarah Lewis, Tessa Langley	Economic evaluations of tobacco control mass media campaigns: a systematic review	https://tobaccocontrol.bmj.com/content/24/4/320
	Summit County ADM Board	2015 Annual Report	SUMMIT_001054571
1-Mar-17	Thomas Gilson, Hugh Shannon, Jaime Freiburger	The Evolution of the Opiate/Opioid Crisis in Cuyahoga County	Academic Forensic Pathology International www.afpjournal.com
2018	Jennifer Carroll, Traci Green, Rita Noonan	Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States	Centers for Disease Control and Prevention, https://www.cdc.gov/drugoverdose/pdf/pubs/2018-evidence-based-strategies.pdf
	Jocelyn Davis, Karen Frantz	Maternal-fetal Opiate Medical Home (MOMH)	https://www.ohiohospitals.org/OHA/media/Images/Patient%20Safety%20and%20Quality/Documents/Patient%20Safety%20Awareness%20Week/2018-PSW-Final-ppt-NR-Feb-12-Maternal-Opiate-Addiction-MOMH-OPSI-pptm.pdf
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2013	Andrew Golub, Luther Elliott	The Opiate Pain Reliever Epidemic among U.S. Arrestees 2000-2010: Regional and Demographic Variations	NIH Public Access. J Ethn Subst Abuse
29-Jul-11	James Livingston, Teresa Milne, Mei Lan Fang, Erica Amari	The effectiveness of interventions for reducing stigma related to substance use disorders: a systematic review	Addiction. 2012 Jan; 107(1): 39–50
Jan. 10, 2018	Ben Young, Sarah Lewis, et al.	Effectiveness of Mass Media Campaigns to Reduce Alcohol Consumption and Harm: A Systematic Review	Alcohol and Alcoholism, 2018, Vol. 53, No. 3
5-Jul-18	Brendan Saloner, Kenneth Stoller, G. Caleb Alexander	Moving Addiction Care to the Mainstream – Improving the Quality of Buprenorphine Treatment	New England Journal of Medicine 379;1
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29-Jun-17	Blue Cross Blue Shield	America's Opioid Epidemic and Its Effect on the Nation's Commercially-Insured Population	Blue Cross Blue Shield, the Health of America Report
2017	Luis Sordo, Gregorio Barrio, Maria Bravo, et al.	Mortality risk during and after opioid substitution treatment: systematic review and meta-analysis of cohort studies	BMJ 2017;357:j1500.
Sept. 2016	IMS Institute for Healthcare Informatics	Use of Opioid Recovery Medications	IMS Institute for Healthcare Informatics
9-May-18	Lisa Clemans-Cope, Douglas Wissoker, Marni Epstein	California County Facts Sheets: Treatment Gaps in Opioid-Agonist Medication-Assisted Therapy (OA-MAT) and Estimates of How Many Additional Prescribers Are needed	Urban Institute https://www.urban.org/sites/default/files/ca_county_fact_sheets_methodological_appendix.pdf
Aug. 2018	Sheena Taha	Best Practices across the Continuum of Care for the Treatment of Opioid Use Disorder	Canadian Centre on Substance Use and Addiction

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Feb. 1, 2019	Qjushi Chen, Marc Larochelle, Davis Weaver, et al.	Prevention of Prescription Opioid Misuse and Projected Overdose Deaths in the United States	JAMA Network Open. 2019;2(2):E187621.
27-Jun-16	Howard Padwa, Darren Urda, Patrick Gauthier, et al.	Organizing Publicly Funded Substance Use Disorder Treatment in the United States	Journal of Substance Abuse Treatment 69 (2016) 9-18
Jul-12	Amanuel Zimam, Teresa Schmidt, et al.	Data on the Diversion, Nonmedical Use and Adverse Outcomes Associated with Pharmaceutical Opioids	Portland State University
	John Kasich, Tracy Plouck	Outlining a Pathway to Increase Prescribers with a DEA DATA 2000 Waiver	Ohio Department of Mental Health and Addiction Services
31-May-18	Kyle Fee	The Opioid Epidemic and Its Effects	Federal Reserve Bank of Cleveland.
8-Jun-17		Testimony of Richard G. Frank before the Joint Economic Committee Hearing: Economic Aspects of the Opioid Crisis	https://www.jec.senate.gov/public/_cache/files/3f089ec3-3765-44e7-a612-cbfaa765232b/dr.-frank---testimony.pdf
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2017	Cuyahoga County Board of Health	Drug-related Emergency Room Visits, Jan. 1 – Dec. 31, 2017; Data Brief: Annual Report 2017	
Dec. 1, 2009	Michael French, Ioana Popovici, Lauren Tapsell	The Economic Costs of Substance Abuse Treatment: Updated Estimates and Cost Bands for Program Assessments and Reimbursement	J Subst Abuse Treat. 2008 Dec; 35(4): 462–469.
Apr. 12, 2018	Mark Patridge	Taking Measures of Ohio's Opioid Crisis	The Ohio State University
25-May-17		Testimony of: Dr. Thomas P. Gilson, Chief Medical Examiner of Cuyahoga County	Hearing of U.S. Senate Permanent Subcommittee on Investigations for the Senate Committee on Homeland Security and Governmental Affairs
Dec. 2015	The National Center on Addiction and Substance Abuse	Guide for Policymakers: Prevention, Early Intervention and Treatment of Risky Substance Use and Addiction	
Aug. 24, 2018	Summit County Jail Operations Advisory Commission	Report and Recommendations	SUMMIT_001773045
30-Jul-18	Kevin Fiscella, Sarah Wakeman, Leo Beletsky	Implementing Opioid Agonist Treatment in Correctional Facilities	JAMA Intern Med. 2018;178(9):1153-1154

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Jan. 20, 2018	Amanda Garrett	Summit County enters new phase of opioid crisis: Deaths decline, but unknown dangers lurk	Akron Beacon Journal/Ohio.com
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Feb. 14, 2017	Sarah Cousins, Desiree Crevecoeur-MacPhail, et al.	The Los Angeles County hub-and-provider network for promoting the sustained use of extended-release naltrexone (XR-NTX) in Los Angeles County (2010-2015)	J Subst Abuse Treat. 2018 Feb;85:78-83
Apr. 4, 2015	Matrix Global Advisors, LLC	Health Care Costs from Opioid Abuse: A State-by-State Analysis	Matrix Global Advisors, LLC
1-Jun-17	SAMHSA's Center for the Application of Prevention Technologies	Media Campaigns to Prevent Prescription Drug Misuse, Youth Marijuana Misuse, and Underage Drinking: Evidence of Effectiveness	https://www.samhsa.gov/capt/sites/default/files/capt_resource/media-campaigns-evaluation-information.pdf
28-Jul-17	SAMHSA's Center for the Application of Prevention Technologies	Media Campaigns to Prevent Prescription Drug and Opioid Misuse	https://www.samhsa.gov/capt/tools-capt-learning-resources/media-campaigns-prevent-rx-drugs-opioid-misuse
Aug. 10, 2018	Sarah Haight, Jean Ko, et al.	Opioid Use Disorder Documented at Delivery Hospitalization – United States, 1999-2014	Centers for Disease Control and Prevention MMWR Morbidity and Mortality Weekly Report / Vol. 67 / No. 31
Aug. 6, 2018	Caleb Alexander	Memorandum re: estimating national naloxone needs	Monument Analytics
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Sept. 2018	U.S. Department of Health and Human Services (HHS)	Facing Addiction in America: The Surgeon General's Spotlight on Opioids	Office of the Surgeon General, https://addiction.surgeongeneral.gov/sites/default/files/Spotlight-on-Opioids_09192018.pdf
26-Jun-18	Dave Yost	The Opioid Crisis: The impact on the Medicaid population is stretching the state's safety net	Ohio Auditor of State, https://www.ohioauditor.gov/publications/Special_Report_The_Opioid_Crisis.pdf

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Aug. 18, 2018	Abby Goodnough	This E.R. Treats Opioid Addiction on Demand. That's Very Rare.	The New York Times
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Dec. 2017	Christopher Ruhm	Geographic Variation in Opioid and Heroin Involved Drug Poisoning Mortality Rates	American Journal of Preventive Medicine 2017;53(6):745-753
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Nov. 2017	Brie Lusheck, Adam White, et al.	Substance Use Prevention in Ohio: Programs, Policies, and Funding to Target Addiction Before it Starts	The Center for Community Solutions
	Summit County Opiate Task Force	2017-2018 Strategic Plan	https://www.summitcountyaddictionhelp.org/Data/Sites/19/pdfs/summit-OTF-plan.pdf
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Jan. 2019	Congressional Budget Office	The Budget and Economic Outlook: 2019 to 2029	
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		GenerationRx Project website	https://stoprxabuseinga.org/generation-rx-project
	Grant Thornton	2017 Government Contractor Survey, Spring 2018	https://www.grantthornton.com/-/media/content-page-files/public-sector/pdfs/surveys/2018/2017-government-contractor-survey
	HUD	FY 2019 Fair Market Rent Documentation System	https://www.huduser.gov/portal/datasets/fmr.html
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Apr. 2018	Ohio Development Services Agency	County Population Projections by Age and Sex, 2015 to 2050	https://development.ohio.gov/reports/reports_pop_proj_map.htm
14-Mar-18	SAMHSA/HHS	An Update on the Opioid Crisis	https://www.samhsa.gov/sites/default/files/aatod_2018_final.pdf
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May-09	Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Prevention	Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis	https://store.samhsa.gov/product/Substance-Abuse-Prevention-Dollars-and-Cents/sma07-4298

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	Tarry House, Inc.	2017 Annual Report	http://tarryhouse.org/wp-content/uploads/2018/05/2017-Tarry-House-Annual-Report-PDF.pdf
	National Center for Health Statistics	Bridged-Race Population Estimates	https://wonder.cdc.gov/Bridged-Race-v2017.HTML
		Employee Count 2006 - 2018 (SUMMIT_001952975).xlsx	SUMMIT_001952975
		The Harvard Kennedy School Government Performance Lab Fellowship Position	https://hwpi.harvard.edu/files/govlabs/files/gpl_fellowship_job_description_2019.pdf
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Jan. 29, 2018	Hugh B. Shannon	Cost of Heroin/Fentanyl Crisis, Fiscal Impacts to CCMEO Operations Update	CUYAH_001633454-55
		CITY OF AKRON invites applications for the position of: Akron Police Officer	https://agency.governmentjobs.com/akron/job_bulletin.cfm?jobID=2351638&sharedWindow=0
2/22/2019	Michael C. O'Malley	Assistant Prosecuting Attorney, Cuyahoga County Prosecutor's Office	https://www.linkedin.com/jobs/view/assistant-prosecuting-attorney-at-cuyahoga-county-prosecutor-s-office-michael-c-o-malley-1074576227/
4/2/2019	Summit County Prosecutor	County of Summit Applicant Portal Assistant County Prosecutor 1	https://jobs.summitoh.net/postings/14953
4/2/2019	Cuyahoga County Prosecutor's Office	Divisions and Units	prosecutor.cuyahogacounty.us/en-US/units-divisions.aspx
		Heroin Related Death Investigations	AKRON_001121745
Feb. 1, 2019	CITY OF CLEVELAND	2019 Mayor's Estimate	http://www.city.cleveland.oh.us/sites/default/files/forms_publications/2019MayorsEstimate.pdf
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4/3/2019		Cuyahoga Drug Drop Locations	http://www.arcgis.com/home/webmap/viewer.html?webmap=496812df0d1c4bca16c27e22471ab03&extent=-82.1203,41.2559,-81.1549,41.6434
4/3/2019	Summit County Public Health	D.U.M.P. Box Locations	https://www.scph.org/medication-disposal/dump-box-locations
Apr. 25, 2018	Karen Farkas	Dispose of unwanted medications April 28 - National Prescription Drug Take Back Day	https://www.cleveland.com/cuyahoga-county/2018/04/dispose_of_unwanted_medications_april_28_on_national_prescription_drug_take_back_day.html

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4/16/2018	Joshua Brockman	For Unused Medications, a Persistent Disposal Dilemma	https://undark.org/article/unused-medication-drug-take-back/
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4/3/2019		NADDI Drug Drop Boxes - Purchase Today	rxdrugdropbox.org/purchase-rx-drug-drop-box/
May 4, 2016	Surabhi Dangi-Garimella, PhD	Safe Disposal of Prescription Medications Faces a Cost Barrier	https://www.ajmc.com/newsroom/safe-disposal-of-prescription-medications-the-cost-barrier
	North Carolina Department of Insurance, Child Fatality Task Force	Safe Drug Disposal Costs	https://ncdoi.com/osfm/safekids/Documents/OMD/Safe%20Drug%20Disposal%20Fact%20Sheet.pdf
Apr. 1, 2017	Kelly S. Barth, Sarah Ball, Rachel Sayko Adams, Ruslan Nikitin, Nikki R. Wooten, Zaina P. Qureshi, and Mary Jo Larson	Development and Feasibility of an Academic Detailing Intervention to Improve Prescription Drug Monitoring Program Use Among Physicians, J Contin Educ Health Prof. 2017 Spring; 37(2): 98-105.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5521811/
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	Ohio Development Services Agency	Ohio County Profiles - Summit County	https://development.ohio.gov/files/research/C1078.pdf
January 2007	National Alliance to End Homelessness	Supportive Housing is Cost Effective	
March 2010	HUD	Costs Associated with First Time Homelessness for Families and Individuals, U.S. Department of Housing and Urban Development Office of Policy Development and Research	http://www.huduser.org/portal/publications/povsoc/cost_homelessness.html
5/29/2015	United States Interagency Council on Homelessness	Ending Chronic Homelessness in 2017	https://www.usich.gov/news/ending-chronic-homelessness-in-2017/

Date	Author(s)	Title	Source
May/June 2018	Theddeus Iheanacho, Elina Stefanovics and Robert Rosenheck	Opioid use disorder and homelessness in the Veterans Health Administration: The challenge of multimorbidity, Journal of Opioid Management 14:3, May/June 2018, 171-182	https://www.ncbi.nlm.nih.gov/pubmed/30044482
4/3/2019		Clinical Study Results HARVONI® (ledipasvir 90 mg/sofosbuvir 400 mg) tablets	https://www.harvoni.com/discover-harvoni/clinical-study-results
Jul. 20, 2018	Ohio Department of Health	Cuyahoga County HIV Surveillance Data Tables	https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/hiv-aids-surveillance-program/resources/cuyahoga-county-hiv-surveillance-data-tables
Jul. 20, 2018	Ohio Department of Health	Summit County HIV Surveillance Data Tables	https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/hiv-aids-surveillance-program/resources/summit-county-hiv-surveillance-data-tables
4/3/2019		EPCLUSA® (sofosbuvir 400 mg/velpatasvir 100 mg) tablets What Is EPCLUSA?	https://www.epclusa.com/what-is-epclusa/
Mar. 27, 2018	Lindsey Dawson and Jennifer Kates	HIV and the Opioid Epidemic: 5 Key Points The Henry J. Kaiser Family Foundation	https://www.kff.org/hiv/aids/issue-brief/hiv-and-the-opioid-epidemic-5-key-points/
Mar. 8, 2017	Centers for Disease Control and Prevention	HIV Cost-effectiveness, Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention	https://www.cdc.gov/hiv/programresources/guidance/costeffectiveness/index.html
Jan. 29, 2019	Centers for Disease Control and Prevention	HIV in the United States and Dependent Areas, Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention	https://www.cdc.gov/hiv/statistics/overview/ata glance.html
Sep. 7, 2018	Substance Abuse and Mental Health Services Administration	Results From The 2017 National Survey On Drug Use And Health: Detailed Tables	
Oct. 23, 2017	Louisa Degenhardt, Amy Peacock, Samantha Colledge et. al.	Global prevalence of injecting drug use and sociodemographic characteristics and prevalence of HIV, HBV, and HCV in people who inject drugs: a multistage systematic review, Lancet Glob Health 2017; 5: e1192–207	http://dx.doi.org/10.1016/S2214-109X(17)30375-3
Dec. 28, 2017	Justin Sayers	They bond over pain. In this Louisv-11e program, inmates don't have to detox alone, Louisville Courier Journal	https://www.courier-journal.com/story/news/local/2017/12/28/louisville-largest-detox-program-brings-common-bonds-pain-hope-jail-inmates/612766001/
2017	Cuyahoga County Sheriff's Department	2017 Annual Report	https://sheriff.cuyahogacounty.us/pdf_sheriff/en-US/AnnualReports/2017AnnualReport.pdf
2017	Summit County Sheriff's Office	2017 Annual Report	https://co.summitoh.net/SHERIFF/images/stories/PDFs/2017%20annual%20report.pdf
May 23, 2018	Kenneth V. Mills		CUYAH 003505168-67

Date	Author(s)	Title	Source
4/21/2016	Donisha Greene	Cuyahoga County Launches Comprehensive Reentry Services at Euclid Jail	executive.cuyahogacounty.us/en-US/CC-LaunchesCompReentrySrvs-EuclidJail.aspx
Sep. 6, 2017	Barbara Poppe and associates	What will it take to end homelessness in Ohio?, Data Analysis prepared for the Ohio Development Services Agency (DSA) and Ohio Mental Health and Addiction Services (OMHAS)	https://development.ohio.gov/files/cs/FinalStatewideDataReport.pdf
Jun. 6, 2017	Karen Farkas	What you need to know about the Cleveland-Cuyahoga County jail agreement	https://www.cleveland.com/cuyahoga-county/2017/06/cuyahoga-county-to-merge-operations.html
February, 2018	Cuyahoga County Division of Children and Family Services	2017 Statistical Report, January - December 2017	http://cfs.cuyahogacounty.us/en-US/Statistical-Reports.aspx
November, 2018	Cuyahoga County Division of Children and Family Services	2018 Statistical Report, January - September 2018	http://cfs.cuyahogacounty.us/en-US/Statistical-Reports.aspx
August, 2013	Public Children Services Association of Ohio	Ohio Child Welfare Functional Job Analysis Research, Caseload Complexity Survey – Preliminary Report	http://www.pcsao.org/perch/resources/prelim-report-of-survey-results-8-13.pdf
Mar. 9, 2018	Robin Ghertner, Melinda Baldwin, Gilbert Crouse, et al.	The Relationship between Substance Use Indicators and Child Welfare Caseloads, ASPE Research Brief, U.S. Department of Health and Human Services	
December, 2017	Public Children Services Association of Ohio	The Opioid Epidemic's Impact on Children Services in Ohio	http://www.pcsao.org/pdf/advocacy/OpioidBriefingSlidesUpdated12-17.pdf
April, 2018	U.S. Department of Health and Human Services	Implementing Nurse-Family Partnership (NFP), Home Visiting Evidence of Effectiveness, Administration for Children & Families	https://homvee.acf.hhs.gov/Implementation/3/Nurse-Family-Partnership--NFP--Estimated-Costs-of-Implementation/14/5

All other documents and data cited in the report, tables, and appendices.

Interviews and Meetings with Members of the Communities

Cuyahoga

Call with Dr. Thomas Gilson and Hugh Shannon of Cuyahoga Medical Examiner, June 22, 2018.

Call with Scott Osiecki of Cuyahoga Medical Examiner, June 26, 2018.

Call with Maggie Keenan of Cuyahoga County, June 27, 2019.

Meeting with Mark Majer of Cuyahoga County Juvenile Court, July 11, 2018.

Meeting with Molly Leckler of Cuyahoga County Drug Court, July 11, 2018.

Meeting with Cynthia Weiskittel of Cuyahoga County Division of Children and Family Services, July 11, 2018.

Meeting with Scott Osiecki of Cuyahoga Medical Examiner, July 11, 2018

Meeting with Maggie Keenan of Cuyahoga County, July 11, 2018

Meeting with Vince Caraffi of Cuyahoga County Board of Health, July 12, 2018.

Meeting with Dr. Thomas Gilson and Hugh Shannon of Cuyahoga Medical Examiner, July 12, 2018.

Call with Cynthia Weiskittel of Cuyahoga County Division of Children and Family Services, July 31, 2018.

Call with Dr. Theodore Parran of St. Vincent Charity Medical Center, July 31, 2018.

Call with David Merriman of Cuyahoga County Department of Health and Human Services, August 6, 2018.

Call with Cynthia Weiskittel of Cuyahoga County Division of Children and Family Services, January 2, 2019.

Call with Scott Osiecki of Cuyahoga Medical Examiner, January 4, 2019.

Call with Cynthia Weiskittel of Cuyahoga County Division of Children and Family Services, January 7, 2019.

Call with Scott Osiecki of Cuyahoga Medical Examiner, January 9, 2019.

Call with Dr. Theodore Parran of St. Vincent Charity Medical Center, January 14, 2019.

Summit

Call with G. Craig of Summit County Alcohol, Drug Addiction & Mental Health Services Board, July 3, 2018.

Call with S. Barker of Summit County Sheriff's Office, July 31, 2018.

Round-table Meeting with Representatives of the Summit County Community, July 11, 2018.

Call with D. Skoda of Summit County Public Health, January 4, 2019.

Call with L. Kohler of Summit County Medical Examiner, January 7, 2019.

Call with G. Craig, D. Smith, and J. Peveich of Summit County Alcohol, Drug Addiction & Mental Health Services Board, January 10, 2019.

Call with A. Davidson, J. Barnes, D. Kearns of Summit County Children Services Board, January 11, 2019.

Call with G. Craig, D. Smith, and J. Peveich of Summit County Alcohol, Drug Addiction & Mental Health Services Board, January 22, 2019.

Call with G. Craig, D. Smith, and J. Peveich of Summit County Alcohol, Drug Addiction & Mental Health Services Board, January 28, 2019.

Call with Dr. N. Labor of Summa Health, February 1, 2019.

Cleveland

Meeting with Nicole Carlton, Cleveland EMS, Commissioner, July 11, 2018.

Meeting with Gary Gingell, Cleveland Division of Police, Commander, Narcotics Unit, July 11, 2018.

Meeting with Anthony Luke, Cleveland Division of Fire, Acting Assistant Chief, July 11, 2018.

Meeting with Persis Sosiak, Cleveland Department of Public Health, Commissioner of Health, July 11, 2018.

Meeting with Gloria Langford, Cleveland Human Resources, Administrative Manager, July 11, 2018.

Meeting with Greg Cordek, Cleveland Office Budget and Management, Manager, July 11, 2018.

CONFIDENTIAL**APPENDIX D****Table C.0****ODU Population in Year 1, Cuyahoga County**

[1]	ODU Rate	1.4%
[2]	Cuyahoga County population 12+, 2017	1,077,588
[3]	ODU population, Year 1	15,167
[4]	% ODU population receiving treatment	20.0%
[5]	ODU population receiving treatment, Year 1	3,033
[6]	MAT % of ODU treatment	33.3%
[7]	ODU population receiving MAT, Year 1	1,011

Sources and Notes:

[1]=0.77% ODU prevalence + 0.63% HUD prevalence. See Pitt AL, Humphreys K, and Brandeau ML (2018), Supplement at S4 and Table A. 0.63% HUD prevalence = 0.51% HUD after ODU prevalence / 80% of HUD individuals with ODU first.

[2]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 or older, Cuyahoga County.

[3]=[1]*[2].

[4], [6]: Based on available data on treatment received by the population with ODU. See e.g., SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2 ("Only 20% with ODU received specialty addiction treatment"); Emma Sandoe, Carrie E. Fry and Richard G. Frank, "Policy Levers That States Can Use to Improve Opioid Addiction Treatment and Address the Opioid Epidemic," Health Affairs, October 2, 2018 ("[F]ewer than 10 percent of those with an ODU receive MAT").

[5]=[3]*[4].

[7]=[5]*[6].

CONFIDENTIAL**APPENDIX D****Table S.0****ODU Population in Year 1, Summit County**

[1]	ODU Rate	1.4%
[2]	Summit County population 12+, 2017	467,186
[3]	ODU population, Year 1	6,576
[4]	% ODU population receiving treatment	20.0%
[5]	ODU population receiving treatment, Year 1	1,315
[6]	MAT % of ODU treatment	33.3%
[7]	ODU population receiving MAT, Year 1	438

Sources and Notes:

[1]=0.77% ODU prevalence + 0.63% HUD prevalence. See Pitt AL, Humphreys K, and Brandeau ML (2018), Supplement at S4 and Table A. 0.63% HUD prevalence = 0.51% HUD after ODU prevalence / 80% of HUD individuals with ODU first.

[2]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 or older, Summit County.

[3]=[1]*[2].

[4], [6]: Based on available data on treatment received by the population with ODU. See e.g., SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2 ("Only 20% with ODU received specialty addiction treatment"); Emma Sandoe, Carrie E. Fry and Richard G. Frank, "Policy Levers That States Can Use to Improve Opioid Addiction Treatment and Address the Opioid Epidemic," Health Affairs, October 2, 2018 ("[F]ewer than 10 percent of those with an ODU receive MAT").

[5]=[3]*[4].

[7]=[5]*[6].

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APPENDIX D

Table I
Historical and Projected Inflation

	1/2009 to 12/2018 [A]	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Actual inflation:</i>																			
[1] Consumer price index, all items	19.2%	2.1%	1.9%																
[2] Consumer price index, prescription drugs	37.2%	2.8%	(0.6%)																
[3] Consumer price index, medical care services	34.0%	1.6%	2.6%																
[4] Employment cost index, private industry	23.1%	2.6%	3.0%																
[5] Employment cost index, state and local govt	22.7%	2.5%	2.7%																
<i>Projected inflation:</i>																			
[6] Consumer price index, all items				2.1%	2.6%	2.6%	2.5%	2.5%	2.4%	2.3%	2.3%	2.3%	2.3%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
[7] Consumer price index, prescription drugs				4.1%	5.0%	5.0%	4.8%	4.8%	4.6%	4.4%	4.4%	4.4%	4.4%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
[8] Consumer price index, medical care services				3.7%	4.6%	4.6%	4.4%	4.4%	4.2%	4.1%	4.1%	4.1%	4.1%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
[9] Employment cost index, private industry				3.4%	3.6%	3.6%	3.4%	3.3%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%
[10] Employment cost index, state and local govt				3.3%	3.5%	3.5%	3.3%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%

Sources and Notes:

[1]-[5]: Bureau of Labor Statistics. CPI series are for U.S. city average, all urban consumers, seasonally adjusted. ECI series are for total compensation, all industries and occupations.

[6], [9]: Congressional Budget Office, The Budget and Economic Outlook: 2019 to 2029. Table E-1.

[7]=[6]*([2A]/[1A]).

[8]=[6]*([3A]/[1A]).

[10]=[9]*([5A]/[4A]).

APPENDIX D: TREATMENT

CONFIDENTIAL**APPENDIX D****Table C.1****Estimated Cost of Treatment, Cuyahoga County**

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population receiving treatment</i>																
[1]	Population receiving treatment, low case	3,033	4,045	5,056	6,067	6,067	6,067	5,842	5,617	5,393	5,168	4,943	4,719	4,494	4,269	4,045
[2]	Population receiving treatment, base case	3,033	4,045	5,056	6,067	6,067	6,067	6,067	6,067	6,067	6,067	6,067	6,067	6,067	6,067	6,067
[3]	Population receiving treatment, high case	3,033	4,045	5,056	6,067	6,067	6,067	6,292	6,516	6,741	6,966	7,190	7,415	7,640	7,864	8,089
<i>Estimated cost of treatment</i>																
		<i>2019\$ [A]</i>														
[4]	Average cost of treatment provided	\$24,023 / person	\$25,126	\$26,279	\$27,439	\$28,650	\$29,864	\$31,077	\$32,339	\$33,652	\$35,018	\$36,502	\$38,048	\$39,660	\$41,341	\$44,918
<i>Specialized facility for families</i>		<i>2019\$ [B]</i>														
[5]	# of residential units required	75														
[6]	Housing cost per unit	\$10,032														
[7]	Childcare cost per unit	\$9,541														
[8]	Resident costs (\$000s)	\$1,468														
[9]	Other operating costs (\$000s)	\$1,165														
[10]	Cost of facility (\$000s)	\$2,633	\$2,702	\$2,772	\$2,841	\$2,912	\$2,982	\$3,051	\$3,121	\$3,193	\$3,266	\$3,345	\$3,425	\$3,507	\$3,591	\$3,678
<i>Total cost of treatment</i>		<i>2020-2034 [C]</i>														
[11]	Low case (\$000s)	\$2,595,019	\$78,920	\$109,060	\$141,565	\$176,728	\$184,163	\$191,588	\$192,047	\$192,228	\$192,109	\$191,987	\$191,510	\$190,650	\$189,374	\$187,649
[12]	Base case (\$000s)	\$3,003,359	\$78,920	\$109,060	\$141,565	\$176,728	\$184,163	\$191,588	\$199,313	\$207,351	\$215,714	\$224,794	\$234,257	\$244,120	\$254,398	\$265,111
[13]	High case (\$000s)	\$3,411,700	\$78,920	\$109,060	\$141,565	\$176,728	\$184,163	\$191,588	\$206,580	\$222,474	\$239,320	\$257,601	\$277,004	\$297,589	\$319,422	\$342,573

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: Cost estimated based on Dr. Parran's description of treatment needs (Parran Report at pp. 127, 136-137) and a study of the economic costs of substance abuse treatments (Alexandre PK, Beulaygue IC, French MT et al. (2012)).

[C]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table C.0[5]. Projects that the number of individuals receiving treatment doubles by Year 4. Base case projects the number of individuals receiving treatment remains constant thereafter. Low case projects that the number of individuals receiving treatment will decline by 1/3 from Year 5 to Year 15. High case projects that the number of individuals receiving treatment will increase by 1/3 from Year 5 to Year 15.

[4]: Estimated cost based on [A] and medical care services inflation.

[5]: Double the capacity of Miracle Village, which was a 30-unit apartment building for mothers receiving intensive treatment.

[6]: Based on HUD fair market rent in 2019 for a 2-bedroom residence in Cuyahoga County.

[7]: Average cost of infant childcare in Ohio, as reported by the Economic Policy Institute.

[8]=[5]*([6]+[7])/10^3.

[9]: Based on the (inflation-adjusted) expenditures of Tarry House, a program in Summit County that provided residential recovery/treatment, respite housing, supported housing and community psychiatric and supportive treatment (CPST) and counseling services to nearly 250 different people in 2017.

[10]: [10B]=[8]+[9]. Year 1 onward grown at projected inflation.

[11]=([1]*[4])/10^3+[10].

[12]=([2]*[4])/10^3+[10].

[13]=([3]*[4])/10^3+[10].

CONFIDENTIAL**APPENDIX D****Table S.1****Estimated Cost of Treatment, Summit County**

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population receiving treatment</i>																
[1]	Population receiving treatment, low case	1,315	1,754	2,192	2,630	2,630	2,630	2,533	2,435	2,338	2,241	2,143	2,046	1,948	1,851	1,754
[2]	Population receiving treatment, base case	1,315	1,754	2,192	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630
[3]	Population receiving treatment, high case	1,315	1,754	2,192	2,630	2,630	2,630	2,728	2,825	2,923	3,020	3,117	3,215	3,312	3,410	3,507
<i>Estimated cost of treatment</i>																
		<i>2019\$ [A]</i>														
[4]	Average cost of treatment provided	\$24,023 / person	\$25,126	\$26,279	\$27,439	\$28,650	\$29,864	\$31,077	\$32,339	\$33,652	\$35,018	\$36,502	\$38,048	\$39,660	\$41,341	\$44,918
<i>Specialized facility for families</i>																
		<i>2019\$ [B]</i>														
[5]	# of residential units required	30														
[6]	Housing cost per unit	\$9,720														
[7]	Childcare cost per unit	\$9,541														
[8]	Resident costs (\$000s)	\$578														
[9]	Other operating costs (\$000s)	\$1,165														
[10]	Cost of facility (\$000s)	\$1,743	\$1,789	\$1,835	\$1,881	\$1,928	\$1,974	\$2,020	\$2,066	\$2,114	\$2,162	\$2,214	\$2,267	\$2,322	\$2,377	\$2,493
<i>Total cost of treatment</i>																
		<i>2020-2034 [C]</i>														
[11]	Low case (\$000s)	\$1,136,064	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$83,975	\$84,070	\$84,035	\$84,000	\$83,811	\$83,457	\$82,923	\$81,257
[12]	Base case (\$000s)	\$1,313,100	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$87,125	\$90,626	\$94,269	\$98,223	\$102,344	\$106,639	\$111,114	\$115,778
[13]	High case (\$000s)	\$1,490,135	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$90,275	\$97,183	\$104,503	\$112,447	\$120,877	\$129,820	\$139,305	\$149,362

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: Cost estimated based on Dr. Parran's description of treatment needs (Parran Report at pp. 127, 136-137) and a study of the economic costs of substance abuse treatments (Alexandre PK, Beulaygue IC, French MT et al. (2012)).

[C]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table S.0[5]. Projects that the number of individuals receiving treatment doubles by Year 4. Base case projects the number of individuals receiving treatment remains constant thereafter. Low case projects that the number of individuals receiving treatment will decline by 1/3 from Year 5 to Year 15. High case projects that the number of individuals receiving treatment will increase by 1/3 from Year 5 to Year 15.

[4]: Estimated cost based on [A] and medical care services inflation.

[5]: Based on the capacity of Miracle Village, which was a 30-unit apartment building for mothers receiving intensive treatment.

[6]: Based on HUD fair market rent in 2019 for a 2-bedroom residence in Summit County.

[7]: Average cost of infant childcare in Ohio, as reported by the Economic Policy Institute.

[8]=[5]*([6]+[7])/10^3.

[9]: Based on the (inflation-adjusted) expenditures of Tarry House, a program in Summit County that provided residential recovery/treatment, respite housing, supported housing and community psychiatric and supportive treatment (CPST) and counseling services to nearly 250 different people in 2017.

[10]: [10B]=[8]+[9]. Year 1 onward grown at projected inflation.

[11]=([1]*[4])/10^3+[10].

[12]=([2]*[4])/10^3+[10].

[13]=([3]*[4])/10^3+[10].

CONFIDENTIAL**APPENDIX D**

Table C.2
Estimated Cost of MAT, Cuyahoga County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
[1]	MAT % of population receiving treatment	33.3%	44.4%	55.6%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
<i>Projected population receiving MAT</i>																
[2]	Population receiving MAT, low case	1,011	1,798	2,809	4,045	4,045	4,045	3,895	3,745	3,595	3,445	3,296	3,146	2,996	2,846	2,696
[3]	Population receiving MAT, base case	1,011	1,798	2,809	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045
[4]	Population receiving MAT, high case	1,011	1,798	2,809	4,045	4,045	4,045	4,194	4,344	4,494	4,644	4,794	4,943	5,093	5,243	5,393
<i>Estimated cost of MAT</i>																
		2019\$ [A]														
[5]	Buprenorphine	\$122 / week	\$6,675	\$7,011	\$7,350	\$7,705	\$8,062	\$8,421	\$8,795	\$9,186	\$9,595	\$10,040	\$10,506	\$10,993	\$11,504	\$12,037
[6]	Methadone	\$134 / week	\$7,314	\$7,681	\$8,053	\$8,442	\$8,833	\$9,226	\$9,637	\$10,065	\$10,513	\$11,000	\$11,511	\$12,045	\$12,604	\$13,189
[7]	Naltrexone (VIVITROL®)	\$1,251 / month	\$15,766	\$16,558	\$17,359	\$18,198	\$19,042	\$19,889	\$20,773	\$21,697	\$22,662	\$11,620	\$11,429	\$10,883	\$11,388	\$11,797
[8]	Average annual cost of MAT		\$7,935	\$8,416	\$8,909	\$9,430	\$9,962	\$10,503	\$10,971	\$11,458	\$11,968	\$10,709	\$11,097	\$11,450	\$11,981	\$12,519
<i>Allocation of MAT</i>																
		% of MAT [B]														
[9]	Buprenorphine	35.0%	35.0%	36.0%	37.0%	38.0%	39.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
[10]	Methadone	55.0%	55.0%	53.0%	51.0%	49.0%	47.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%
[11]	Naltrexone (VIVITROL®)	10.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
<i>Total cost of MAT</i>																
		2020-2034 [C]														
[12]	Low case (\$000s)	\$513,592	\$8,024	\$15,129	\$25,023	\$38,140	\$40,291	\$42,482	\$42,727	\$42,911	\$43,026	\$36,897	\$36,570	\$36,019	\$35,896	\$35,632
[13]	Base case (\$000s)	\$594,044	\$8,024	\$15,129	\$25,023	\$38,140	\$40,291	\$42,482	\$44,371	\$46,344	\$48,405	\$43,314	\$44,881	\$46,310	\$48,459	\$50,636
[14]	High case (\$000s)	\$674,497	\$8,024	\$15,129	\$25,023	\$38,140	\$40,291	\$42,482	\$46,014	\$49,777	\$53,783	\$49,730	\$53,192	\$56,602	\$61,023	\$65,639

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: U.S. DOD, Office of the Secretary. 32 CFR Part 199. TRICARE; Mental Health and Substance Use Disorder Treatment. Federal Register, Vol. 81, No. 171, 61068-61098. Adjusted for prescription drug price inflation.

[B]: OhioMHAS estimates that the breakdown of MAT received by clients in Ohio's opioid-treatment programs (OTPs) is 74.2% methadone, 21.5% buprenorphine, and 4.3% naltrexone. This estimate is adjusted to reflect buprenorphine and naltrexone provided via non-OTP treatment facilities, based on data from the National Survey of Substance Abuse Treatment Services, 2017.

[C]=Σ(Year 1 to Year 15).

[1]: Projects that the prevalence of MAT among individuals receiving treatment will double by Year 4 and remain constant thereafter.

[2]=[1]*Table C.1[1].

[3]=[1]*Table C.1[2].

[4]=[1]*Table C.1[3].

[5]-[7]: Annual cost of treatment based on [B] and projected prescription drug price inflation. Naltrexone price drops in 2029 when the drug goes off-patent based on generic pricing trends reported by IMS.

[8]=[5]*[9]+[6]*[10]+[7]*[11].

[9]-[11]: Projects that buprenorphine and naltrexone allocation will increase gradually through Year 6 as the # of PCPs providing MAT increases.

[12]=([2]*[8])/10^3.

[13]=([3]*[8])/10^3.

[14]=([4]*[8])/10^3.

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Table S.2
Estimated Cost of MAT, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
[1]	MAT % of population receiving treatment	33.3%	44.4%	55.6%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
<i>Projected population receiving MAT</i>																
[2]	Population receiving MAT, low case	438	779	1,218	1,754	1,754	1,754	1,689	1,624	1,559	1,494	1,429	1,364	1,299	1,234	1,169
[3]	Population receiving MAT, base case	438	779	1,218	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754
[4]	Population receiving MAT, high case	438	779	1,218	1,754	1,754	1,754	1,818	1,883	1,948	2,013	2,078	2,143	2,208	2,273	2,338
<i>Estimated cost of MAT</i>																
<i>2019\$ [A]</i>																
[5]	Buprenorphine	\$122 / week	\$6,675	\$7,011	\$7,350	\$7,705	\$8,062	\$8,421	\$8,795	\$9,186	\$9,595	\$10,040	\$10,506	\$10,993	\$11,504	\$12,037
[6]	Methadone	\$134 / week	\$7,314	\$7,681	\$8,053	\$8,442	\$8,833	\$9,226	\$9,637	\$10,065	\$10,513	\$11,000	\$11,511	\$12,045	\$12,604	\$13,189
[7]	Naltrexone (VIVITROL®)	\$1,251 / month	\$15,766	\$16,558	\$17,359	\$18,198	\$19,042	\$19,889	\$20,773	\$21,697	\$22,662	\$11,620	\$11,429	\$10,883	\$11,388	\$11,797
[8]	Average annual cost of MAT		\$7,935	\$8,416	\$8,909	\$9,430	\$9,962	\$10,503	\$10,971	\$11,458	\$11,968	\$10,709	\$11,097	\$11,450	\$11,981	\$12,519
<i>Allocation of MAT</i>																
<i>% of MAT [B]</i>																
[9]	Buprenorphine	35.0%	35.0%	36.0%	37.0%	38.0%	39.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
[10]	Methadone	55.0%	55.0%	53.0%	51.0%	49.0%	47.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%
[11]	Naltrexone (VIVITROL®)	10.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
<i>Total cost of MAT</i>																
<i>2020-2034 [C]</i>																
[12]	Low case (\$000s)	\$222,667	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$18,524	\$18,604	\$18,654	\$15,997	\$15,855	\$15,616	\$15,563	\$15,448
[13]	Base case (\$000s)	\$257,547	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$19,237	\$20,092	\$20,986	\$18,779	\$19,458	\$20,078	\$21,009	\$21,953
[14]	High case (\$000s)	\$292,427	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$19,949	\$21,581	\$23,318	\$21,561	\$23,061	\$24,540	\$26,456	\$30,196

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: U.S. DOD, Office of the Secretary. 32 CFR Part 199. TRICARE; Mental Health and Substance Use Disorder Treatment. Federal Register, Vol. 81, No. 171, 61068-61098. Adjusted for prescription drug price inflation.

[B]: OhioMHAS estimates that the breakdown of MAT received by clients in Ohio's opioid-treatment programs (OTPs) is 74.2% methadone, 21.5% buprenorphine, and 4.3% naltrexone. This estimate is adjusted to reflect buprenorphine and naltrexone provided via non-OTP treatment facilities, based on data from the National Survey of Substance Abuse Treatment Services, 2017.

[C]=Σ(Year 1 to Year 15).

[1]: Projects that the prevalence of MAT among individuals receiving treatment will double by Year 4 and remain constant thereafter.

[2]=[1]*Table S.1[1].

[3]=[1]*Table S.1[2].

[4]=[1]*Table S.1[3].

[5]-[7]: Annual cost of treatment based on [B] and projected prescription drug price inflation. Naltrexone price drops in 2029 when the drug goes off-patent based on generic pricing trends reported by IMS.

[8]=[5]*[9]+[6]*[10]+[7]*[11].

[9]-[11]: Projects that buprenorphine and naltrexone allocation will increase gradually through Year 6 as the # of PCPs providing MAT increases.

[12]=([2]*[8])/10^3.

[13]=([3]*[8])/10^3.

[14]=([4]*[8])/10^3.

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Table C.3

Estimated Cost of Recruiting PCPS to Provide MAT, Cuyahoga County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Recruitment staffing requirements</i>	<i>2019\$ [A]</i>															
[1]	FTEs to recruit PCPs to provide MAT	4															
[2]	FTE salary estimate	\$66,000															
[3]	Salary cost (\$000s)	\$264	\$273	\$283	\$293	\$302	\$312	\$321	\$331	\$341	\$351	\$362	\$373	\$384	\$396	\$408	\$421
		<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>															
[4]	FTE employment cost, base case (\$000s)	1.75x	\$478	\$495	\$512	\$529	\$545	\$562	\$579	\$597	\$615	\$634	\$653	\$673	\$693	\$714	\$736
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$9,014	\$478	\$495	\$512	\$529	\$545	\$562	\$579	\$597	\$615	\$634	\$653	\$673	\$693	\$714	\$736

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table S.3

Estimated Cost of Recruiting PCPS to Provide MAT, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
	<i>Recruitment staffing requirements</i>	<i>2019\$ [A]</i>														
[1]	FTEs to recruit PCPs to provide MAT	2														
[2]	FTE salary estimate	\$66,000														
[3]	Salary cost (\$000s)	\$132	\$137	\$142	\$146	\$151	\$156	\$161	\$165	\$170	\$176	\$181	\$187	\$192	\$198	\$204
	<i>Estimated employment cost</i>	<i>Labor Cost Multiplier [B]</i>														
[4]	FTE employment cost, base case (\$000s)	1.75x	\$239	\$248	\$256	\$264	\$273	\$281	\$289	\$298	\$307	\$317	\$326	\$336	\$347	\$357
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>														
[5]	Base case (\$000s)	\$4,507	\$239	\$248	\$256	\$264	\$273	\$281	\$289	\$298	\$307	\$317	\$326	\$336	\$347	\$357

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2]=Table C.3[2].

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table C.4

Estimated Cost of Connecting Individuals to Services, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Staff 24-7 referral hotline</i>	<i>2019\$ [A]</i>															
[1]	Operators required for 24-7 hotline	8															
[2]	FTE salary estimate	\$35,500															
[3]	Salary cost (\$000s)	\$284	\$294	\$304	\$315	\$325	\$335	\$345	\$356	\$367	\$378	\$389	\$401	\$414	\$426	\$439	\$453
	<i>Staff emergency departments</i>	<i>2019\$ [B]</i>															
[4]	Total social workers required	22															
[5]	FTE salary estimate	\$62,000															
[6]	Salary cost (\$000s)	\$1,364	\$1,412	\$1,462	\$1,511	\$1,560	\$1,609	\$1,659	\$1,709	\$1,761	\$1,815	\$1,870	\$1,927	\$1,986	\$2,047	\$2,109	\$2,174
[7]	Estimated opioid-related visits	8,908															
[8]	Recovery coach utilization %	20.0%															
[9]	Visits utilizing recovery coach	1,782															
[10]	Recovery coach hours per client, avg	18															
[11]	Recovery coach hourly rate	\$15.00															
[12]	Salary cost (\$000)	\$481	\$498	\$516	\$533	\$550	\$568	\$585	\$603	\$621	\$640	\$660	\$680	\$700	\$722	\$744	\$767
	<i>Labor Cost</i>																
	<i>Estimated employment cost</i>	<i>Multiplier [C]</i>															
[13]	FTE employment cost, base case (\$000s)	1.75x	\$3,858	\$3,994	\$4,128	\$4,262	\$4,396	\$4,530	\$4,669	\$4,811	\$4,958	\$5,109	\$5,265	\$5,425	\$5,591	\$5,762	\$5,937
	<i>Individuals receiving transportation assistance</i>																
[14]	Individuals transported to treatment, low case		758	1,011	1,264	1,517	1,517	1,517	1,461	1,404	1,348	1,292	1,236	1,180	1,123	1,067	1,011
[15]	Individuals transported to treatment, base case		758	1,011	1,264	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
[16]	Individuals transported to treatment, high case		758	1,011	1,264	1,517	1,517	1,517	1,573	1,629	1,685	1,741	1,798	1,854	1,910	1,966	2,022
	<i>Estimated transportation cost</i>	<i>2019\$ [D]</i>															
[17]	Round trip fare, avg	\$21.00															
[18]	# of round trips per individual per year, avg	36															
[19]	Annual transportation cost per individual, avg	\$756	\$776	\$796	\$816	\$836	\$856	\$876	\$896	\$917	\$938	\$960	\$983	\$1,007	\$1,031	\$1,056	\$1,081
[20]	Cost of transportation, low case (\$000s)		\$588	\$805	\$1,031	\$1,268	\$1,299	\$1,328	\$1,309	\$1,287	\$1,264	\$1,241	\$1,215	\$1,188	\$1,158	\$1,127	\$1,093
[21]	Cost of transportation, base case (\$000s)		\$588	\$805	\$1,031	\$1,268	\$1,299	\$1,328	\$1,359	\$1,390	\$1,422	\$1,456	\$1,491	\$1,527	\$1,564	\$1,601	\$1,640
[22]	Cost of transportation, high case (\$000s)		\$588	\$805	\$1,031	\$1,268	\$1,299	\$1,328	\$1,409	\$1,493	\$1,580	\$1,672	\$1,767	\$1,866	\$1,969	\$2,076	\$2,186
	<i>Web-based referral system</i>	<i>2019\$ [E]</i>															
[23]	Cost of web-based system (000s)	\$112	\$115	\$118	\$121	\$124	\$127	\$130	\$133	\$136	\$139	\$143	\$146	\$150	\$153	\$157	\$161
	<i>Total cost of connecting individuals</i>	<i>2020-2034 [F]</i>															
[24]	Low case (\$000s)	\$91,951	\$4,561	\$4,917	\$5,280	\$5,654	\$5,822	\$5,989	\$6,110	\$6,234	\$6,361	\$6,492	\$6,626	\$6,763	\$6,902	\$7,045	\$7,191
[25]	Base case (\$000s)	\$94,520	\$4,561	\$4,917	\$5,280	\$5,654	\$5,822	\$5,989	\$6,161	\$6,337	\$6,519	\$6,708	\$6,902	\$7,102	\$7,308	\$7,520	\$7,738
[26]	High case (\$000s)	\$97,089	\$4,561	\$4,917	\$5,280	\$5,654	\$5,822	\$5,989	\$6,211	\$6,440	\$6,677	\$6,924	\$7,178	\$7,442	\$7,713	\$7,994	\$8,284

CONFIDENTIAL**APPENDIX D****Table C.4****Estimated Cost of Connecting Individuals to Services, Cuyahoga County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[F]=Σ(Year 1 to Year 15).

[1]=(24 hours*365 days)/(2,080 work hours per operator)*2 operators staffed at all times (rounded).

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10³. Year 1 onwards grown at projected employment cost inflation.

[4]: Assumes on average of one social worker required per hospital. The Ohio Development Services Agency reports that there are 22 registered hospital in Cuyahoga County.

[5]: Salary estimated based on average salary of medical social workers in Cleveland reported by Salary.com.

[6]: [6B]=([4]*[5])/10³. Year 1 onwards grown at projected employment cost inflation.

[7]=524 opioid overdose deaths in Cuyahoga County in 2017 * 17 emergency room visits per overdose death. National Center for Health Statistics and Parran Report at ¶72.

[8]=Table C.0[4].

[9]=[7]*[8].

[10]: Assumes that recovery coaches will work on average 18 hours per client.

[11]: Hourly rate based on hourly rate ranges for recovery coaches reported by Glassdoor.

[12]=([9]*[10]*[11])/10³.

[13]=([3]+[6]+[12])*[C].

[14]-[16]: 25% of Table C.1[1]-[3].

[17]: Based on reported Uber fare rates in Cleveland. Estimated as the average of the minimum fare for a round trip, the fare for a 14 mile round trip, and the fare for a 30 mile round trip. Distances based on average and median distance traveled to OTPs reported in Rosenblum, Cleland, Kayman et al. (2011).

[19]: [19D]=[17]*[18]. Year 1 onwards grown at projected inflation.

[20]=([14]*[19])/10³.

[21]=([15]*[19])/10³.

[22]=([16]*[19])/10³.

[23]: [23E] based on cost of findlocaltreatment.com quoted for Franklin County. Year 1 onwards grown at projected inflation.

[24]=[13]+[20]+[23].

[25]=[13]+[21]+[23].

[26]=[13]+[22]+[23].

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Table S.4

Estimated Cost of Connecting Individuals to Services, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Staff 24-7 referral hotline</i>	<i>2019\$ [A]</i>															
[1]	Operators required for 24-7 hotline	8															
[2]	FTE salary estimate	\$35,500															
[3]	Salary cost (\$000s)	\$284	\$294	\$304	\$315	\$325	\$335	\$345	\$356	\$367	\$378	\$389	\$401	\$414	\$426	\$439	\$453
	<i>Staff emergency departments</i>	<i>2019\$ [B]</i>															
[4]	Total social workers required	10															
[5]	FTE salary estimate	\$59,500															
[6]	Salary cost (\$000s)	\$595	\$616	\$638	\$659	\$681	\$702	\$723	\$746	\$768	\$792	\$816	\$841	\$866	\$893	\$920	\$948
[7]	Estimated opioid-related visits	3,230															
[8]	Recovery coach utilization %	20.0%															
[9]	Visits utilizing recovery coach	646															
[10]	Recovery coach hours per client, avg	18															
[11]	Recovery coach hourly rate	\$15.00															
[12]	Salary cost (\$000)	\$174	\$181	\$187	\$193	\$200	\$206	\$212	\$219	\$225	\$232	\$239	\$246	\$254	\$262	\$270	\$278
	<i>Labor Cost</i>																
	<i>Estimated employment cost</i>	<i>Multiplier [C]</i>															
[13]	FTE employment cost, base case (\$000s)	1.75x	\$1,909	\$1,976	\$2,043	\$2,109	\$2,175	\$2,242	\$2,310	\$2,380	\$2,453	\$2,528	\$2,605	\$2,684	\$2,766	\$2,851	\$2,938
	<i>Individuals receiving transportation assistance</i>																
[14]	Individuals transported to treatment, low case		329	438	548	658	658	658	633	609	585	560	536	511	487	463	438
[15]	Individuals transported to treatment, base case		329	438	548	658	658	658	658	658	658	658	658	658	658	658	658
[16]	Individuals transported to treatment, high case		329	438	548	658	658	658	682	706	731	755	779	804	828	852	877
	<i>Estimated transportation cost</i>	<i>2019\$ [D]</i>															
[17]	Round trip fare, avg	\$22.00															
[18]	# of round trips per individual per year, avg	36															
[19]	Annual transportation cost per individual, avg	\$792	\$813	\$834	\$855	\$876	\$897	\$918	\$939	\$960	\$982	\$1,006	\$1,030	\$1,055	\$1,080	\$1,106	\$1,133
[20]	Cost of transportation, low case (\$000s)		\$267	\$365	\$468	\$576	\$590	\$603	\$594	\$585	\$574	\$563	\$552	\$539	\$526	\$512	\$496
[21]	Cost of transportation, base case (\$000s)		\$267	\$365	\$468	\$576	\$590	\$603	\$617	\$631	\$646	\$661	\$677	\$694	\$710	\$727	\$745
[22]	Cost of transportation, high case (\$000s)		\$267	\$365	\$468	\$576	\$590	\$603	\$640	\$678	\$718	\$759	\$803	\$848	\$894	\$943	\$993
	<i>Web-based referral system</i>	<i>2019\$ [E]</i>															
[23]	Cost of web-based system (000s)	\$112	\$115	\$118	\$121	\$124	\$127	\$130	\$133	\$136	\$139	\$143	\$146	\$150	\$153	\$157	\$161
	<i>Total cost of connecting individuals</i>	<i>2020-2034 [F]</i>															
[24]	Low case (\$000s)	\$45,835	\$2,291	\$2,460	\$2,632	\$2,809	\$2,892	\$2,975	\$3,037	\$3,101	\$3,167	\$3,234	\$3,303	\$3,374	\$3,446	\$3,519	\$3,595
[25]	Base case (\$000s)	\$47,002	\$2,291	\$2,460	\$2,632	\$2,809	\$2,892	\$2,975	\$3,060	\$3,148	\$3,238	\$3,332	\$3,428	\$3,528	\$3,630	\$3,735	\$3,843
[26]	High case (\$000s)	\$48,169	\$2,291	\$2,460	\$2,632	\$2,809	\$2,892	\$2,975	\$3,083	\$3,195	\$3,310	\$3,430	\$3,554	\$3,682	\$3,814	\$3,950	\$4,091

CONFIDENTIAL**APPENDIX D****Table S.4****Estimated Cost of Connecting Individuals to Services, Summit County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[F]=Σ(Year 1 to Year 15).

[1]=(24 hours*365 days)/(2,080 work hours per operator)*2 operators staffed at all times (rounded).

[2]=Table C.4[2].

[3]: [3A]=([1]*[2])/10³. Year 1 onwards grown at projected employment cost inflation.

[4]: Assumes on average of one new social worker per hospital. The Ohio Development Services Agency reports that there are 10 registered hospital in Summit County.

[5]: Salary estimated based on average salary of medical social workers in Akron reported by Salary.com.

[6]: [6B]=([4]*[5])/10³. Year 1 onwards grown at projected employment cost inflation.

[7]=190 opioid overdose deaths in Summit County in 2017 * 17 emergency room visits per overdose death. National Center for Health Statistics and Parran Report at ¶72.

[8]: Assumes that 1 in 4 opioid-related emergency department visitors will accept assistance from a recovery coach.

[9]=[7]*[8].

[10]: Assumes that recovery coaches will work on average 18 hours with each client.

[11]: Hourly rate based on hourly rate ranges for recovery coaches reported by Glassdoor.

[12]=([9]*[10]*[11])/10³.

[13]=([3]+[6]+[12])*[C].

[14]-[16]: 25% of Table S.1[1]-[3].

[17]: Based on reported Uber fares. Estimated as the average of the minimum fare for a round trip, the fare for a 14 mile round trip, and the fare for a 30 mile round trip. Distances based on average and median distance traveled to OTP reported in Rosenblum, Cleland, Kayman et al. (2011).

[19]: [19D]=[17]*[18]. Year 1 onwards grown at projected inflation.

[20]=([14]*[19])/10³.

[21]=([15]*[19])/10³.

[22]=([16]*[19])/10³.

[23]: [23E] based on cost of findlocaltreatment.com quoted for Franklin County. Year 1 onwards grown at projected inflation.

[24]=[13]+[20]+[23].

[25]=[13]+[21]+[23].

[26]=[13]+[22]+[23].

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Table C.5

Estimated Cost of Special Populations: Child Welfare, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Child welfare agency staffing</i>	<i>2019\$ [A]</i>														
[1]	Investigation, active cases	2,303														
[2]	Ongoing, active cases	1,911														
[3]	Adoption and other, active cases	557														
[4]	Subtotal, active cases	4,771														
[5]	Social worker, investigation caseload	12														
[6]	Social worker, ongoing caseload	10														
[7]	Social worker, perm. support caseload	20														
[8]	Family advocate, ongoing caseload	10														
[9]	Opioid-related %	15.7%														
[10]	Required # of social workers	80														
[11]	FTE salary estimate	\$52,500														
[12]	Salary cost (\$000s)	\$4,200	\$4,349	\$4,503	\$4,653	\$4,805	\$4,956	\$5,107	\$5,263	\$5,423	\$5,589	\$5,759	\$5,935	\$6,116	\$6,303	\$6,495
[13]	Required # of family advocates	30														
[14]	FTE salary estimate	\$38,500														
[15]	Salary cost (\$000s)	\$1,155	\$1,196	\$1,238	\$1,280	\$1,321	\$1,363	\$1,404	\$1,447	\$1,491	\$1,537	\$1,584	\$1,632	\$1,682	\$1,733	\$1,786
[16]	Trauma counselor for CFS staff	1														
[17]	FTE salary estimate	\$61,500														
[18]	Salary cost (\$000s)	\$62	\$64	\$66	\$68	\$70	\$73	\$75	\$77	\$79	\$82	\$84	\$87	\$90	\$92	\$95
[19]	Staff to recruit foster families	3														
[20]	FTE salary estimate	\$52,500														
[21]	Salary cost (\$000s)	\$158	\$163	\$169	\$175	\$180	\$186	\$192	\$197	\$203	\$210	\$216	\$223	\$229	\$236	\$244
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>														
[22]	FTE employment cost, base case (\$000s)	1.75x	\$10,100	\$10,458	\$10,808	\$11,159	\$11,510	\$11,861	\$12,223	\$12,596	\$12,980	\$13,376	\$13,784	\$14,204	\$14,638	\$15,084
	<i>Cost of out-of-home placements</i>	<i>2019\$ [C]</i>														
[23]	Children placed in foster/instl care, avg #	1,454														
[24]	Opioid-related % of removals	15.7%														
[25]	Est. cost per placement, avg	\$17,492														
[26]	Estimated placement cost (\$000s)	\$3,999	\$4,103	\$4,210	\$4,315	\$4,423	\$4,529	\$4,633	\$4,740	\$4,849	\$4,960	\$5,079	\$5,201	\$5,326	\$5,454	\$5,585
	<i>Child care for at-risk families</i>	<i>2019\$ [D]</i>														
[27]	Minors receiving in-home services, avg #	2,775														
[28]	Opioid-related %	15.7%														
[29]	% receiving day care services	33.0%														
[30]	Annual childcare cost	\$9,541														
[31]	Childcare cost (\$000)	\$1,373	\$1,408	\$1,445	\$1,481	\$1,518	\$1,555	\$1,590	\$1,627	\$1,664	\$1,703	\$1,743	\$1,785	\$1,828	\$1,872	\$1,917
	<i>Total cost for special population</i>	<i>2020-2034 [E]</i>														
[32]	Base case (\$000s)	\$288,551	\$15,612	\$16,113	\$16,604	\$17,100	\$17,594	\$18,085	\$18,590	\$19,109	\$19,643	\$20,199	\$20,771	\$21,359	\$21,964	\$22,586

CONFIDENTIAL**APPENDIX D****Table C.5****Estimated Cost of Special Populations: Child Welfare, Cuyahoga County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[E]=Σ(Year 1 to Year 15).

[1]-[4], [23], [27]: Cuyahoga County Division of Children and Family Services, 2018 Statistical Report: January - September 2018 at pp. 5-7.

[5]-[7]: Deposition of Cynthia G. Weiskittel, November 13, 2018, at 88:19-22; 91:15-16; and 92:8-13.

[8]: Assumed to be approximately equal to [6].

[9], [28]: Assumed equal to [24].

[10]=[9]*([1]/[5]+[2]/[6]+([2]+[3])/[7]) (rounded).

[11], [14], [17], [20]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[12]=([10]*[11])/10³. Year 1 onwards grown at projected employment cost inflation.

[13]=[9]*([2]/[8]) (rounded).

[15]=([13]*[14])/10³. Year 1 onwards grown at projected employment cost inflation.

[18]=([16]*[17])/10³. Year 1 onwards grown at projected employment cost inflation.

[21]=([19]*[20])/10³. Year 1 onwards grown at projected employment cost inflation.

[22]=([12]+[15]+[18]+[21])*[B].

[24]: 2017 opioid-related % of removals for Cuyahoga Children and Family Services, see Cutler Report, Table III.6[1].

[25]: Estimated based on boarding and care costs and placements for foster care and institutional housing in 2017.

[26]: [26C]=([23]*[24]*[25])/10³. Year 1 onwards grown at projected inflation.

[29]: % of minor population (<18) that is under 6-years old. National Center for Health Statistics, Bridged-Race Population Estimates, Cuyahoga County.

[30]=Table C.1[7].

[31]: [31D]=([27]*[28]*[29]*[30])/10³. Year 1 onwards grown at projected inflation.

[32]=[22]+[26]+[31].

CONFIDENTIAL**APPENDIX D****Table S.5****Estimated Cost of Special Populations: Child Welfare, Summit County**

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Child welfare agency staffing</i>	<i>2019\$ [A]</i>														
[1]	Investigation, active cases	1,007														
[2]	Ongoing, active cases	836														
[3]	Adoption and other, active cases	244														
[4]	Subtotal, active cases	2,087														
[5]	Social worker, investigation caseload	12														
[6]	Social worker, ongoing caseload	10														
[7]	Social worker, perm. support caseload	20														
[8]	Family advocate, ongoing caseload	10														
[9]	Opioid-related %	27.0%														
[10]	Required # of social workers	60														
[11]	FTE salary estimate	\$52,500														
[12]	Salary cost (\$000s)	\$3,150	\$3,262	\$3,377	\$3,490	\$3,603	\$3,717	\$3,830	\$3,947	\$4,068	\$4,192	\$4,319	\$4,451	\$4,587	\$4,727	\$5,020
[13]	Required # of family advocates	23														
[14]	FTE salary estimate	\$38,500														
[15]	Salary cost (\$000s)	\$886	\$917	\$949	\$981	\$1,013	\$1,045	\$1,077	\$1,110	\$1,143	\$1,178	\$1,214	\$1,251	\$1,289	\$1,329	\$1,411
[16]	Trauma counselor for CFS staff	1														
[17]	FTE salary estimate	\$61,500														
[18]	Salary cost (\$000s)	\$62	\$64	\$66	\$68	\$70	\$73	\$75	\$77	\$79	\$82	\$84	\$87	\$90	\$92	\$98
[19]	Staff to recruit foster families	2														
[20]	FTE salary estimate	\$52,500														
[21]	Salary cost (\$000s)	\$105	\$109	\$113	\$116	\$120	\$124	\$128	\$132	\$136	\$140	\$144	\$148	\$153	\$158	\$167
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>														
[22]	FTE employment cost, base case (\$000s)	1.75x	\$7,614	\$7,884	\$8,147	\$8,412	\$8,677	\$8,942	\$9,214	\$9,495	\$9,785	\$10,084	\$10,391	\$10,708	\$11,035	\$11,371
	<i>Cost of out-of-home placements</i>	<i>2019\$ [C]</i>														
[23]	Children placed in foster/instl care, avg #	636														
[24]	Opioid-related % of removals	27.0%														
[25]	Est. cost per placement, avg	\$17,492														
[26]	Estimated placement cost (\$000s)	\$3,006	\$3,084	\$3,164	\$3,244	\$3,325	\$3,404	\$3,483	\$3,563	\$3,645	\$3,729	\$3,818	\$3,910	\$4,004	\$4,100	\$4,299
	<i>Child care for at-risk families</i>	<i>2019\$ [D]</i>														
[27]	Minors receiving in-home services, avg #	1,213														
[28]	Opioid-related %	27.0%														
[29]	% receiving day care services	32.1%														
[30]	Annual childcare cost	\$9,541														
[31]	Childcare cost (\$000)	\$1,004	\$1,030	\$1,057	\$1,083	\$1,110	\$1,137	\$1,163	\$1,190	\$1,217	\$1,245	\$1,275	\$1,306	\$1,337	\$1,369	\$1,435
	<i>Total cost for special population</i>	<i>2020-2034 [E]</i>														
[32]	Base case (\$000s)	\$216,801	\$11,728	\$12,105	\$12,474	\$12,847	\$13,218	\$13,587	\$13,967	\$14,357	\$14,759	\$15,177	\$15,606	\$16,049	\$16,503	\$17,452

CONFIDENTIAL**APPENDIX D****Table S.5****Estimated Cost of Special Populations: Child Welfare, Summit County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[E]=Σ(Year 1 to Year 15).

[1]-[4], [23], [27]: Based on figure in Table C 5, adjusted downward based on the difference in the size of the minor population in Summit County relative to Cuyahoga County.

[5]-[7]: Assumed equal to caseload figures in Table C.5.

[8]: Assumed to be approximately equal to [6].

[9], [28]: Assumed equal to [24].

[10]=[9]*([1]/[5]+[2]/[6]+([2]+[3])/[7]) (rounded).

[11], [14], [17], [20]: Assumed equal to salary estimate figures in Table C.5.

[12]=([10]*[11])/10³. Year 1 onwards grown at projected employment cost inflation.

[13]=[9]*([2]/[8]) (rounded).

[15]=([13]*[14])/10³. Year 1 onwards grown at projected employment cost inflation.

[18]=([16]*[17])/10³. Year 1 onwards grown at projected employment cost inflation.

[21]=([19]*[20])/10³. Year 1 onwards grown at projected employment cost inflation.

[22]=([12]+[15]+[18]+[21])*[B].

[24]: 2017 opioid-related % of removals for Summit Children Services Board, see Cutler Report, Table III.6[2].

[25]=Table C.5[25].

[26]: [26C]=([23]*[24]*[25])/10³. Year 1 onwards grown at projected inflation.

[29]: % of minor population (<18) that is under 6-years old. National Center for Health Statistics, Bridged-Race Population Estimates, Summit County.

[30]=Table S.1[7].

[31]: [31D]=([27]*[28]*[29]*[30])/10³. Year 1 onwards grown at projected inflation.

[32]=[22]+[26]+[31].

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Table C.6

Estimated Cost of Special Populations: Pregnant Women, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Home visit program</i>															
	<i>2019[A]</i>															
[1]	# of opioid-related NAS cases	137														
[2]	Pregnant women with OUD	183														
[3]	Cost per home visit family	\$7,467														
[4]	Cost of home visit program (\$000s)	\$1,366	\$1,429	\$1,495	\$1,561	\$1,630	\$1,699	\$1,768	\$1,839	\$1,914	\$1,992	\$2,076	\$2,164	\$2,256	\$2,351	\$2,451
																\$2,555
	<i>Total cost for special population</i>															
	<i>2020-2034 [B]</i>															
[5]	Base case (\$000s)	\$29,180	\$1,429	\$1,495	\$1,561	\$1,630	\$1,699	\$1,768	\$1,839	\$1,914	\$1,992	\$2,076	\$2,164	\$2,256	\$2,351	\$2,451
																\$2,555

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]=Σ(Year 1 to Year 15).

[1]: McGuire Public Nuisance Report, Appendix E.

[2]=[1]/75% (rounded). 75% based on Keyes Report at p. 25: "Withdrawal symptoms develop in an estimated 55-95% of opioid-exposed infants".

[3]: Based on average cost of Nurse-Family Partnership (NFP) program per family, as reported by HHS Administration for Children & Families.

[4]=([2]*[3])/10^3. Year 1 onwards grown at projected medical services inflation.

[5]=[4].

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Table S.6

Estimated Cost of Special Populations: Pregnant Women, Summit County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Home visit program</i>	<i>2019[A]</i>															
[1]	# of opioid-related NAS cases	71															
[2]	Pregnant women with OUD	95															
[3]	Cost per home-visit family	<i>\$7,467</i>															
[4]	Cost of home visit program (\$000s)	\$709	\$742	\$776	\$810	\$846	\$882	\$918	\$955	\$994	\$1,034	\$1,078	\$1,123	\$1,171	\$1,221	\$1,272	\$1,326
	<i>Total cost for special population</i>	<i>2020-2034 [B]</i>															
[5]	Base case (\$000s)	\$15,148	\$742	\$776	\$810	\$846	\$882	\$918	\$955	\$994	\$1,034	\$1,078	\$1,123	\$1,171	\$1,221	\$1,272	\$1,326

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]=Σ(Year 1 to Year 15).

[1]: McGuire Public Nuisance Report, Appendix E.

[2]=[1]/75% (rounded). 75% based on Keyes Report at p. 25: "Withdrawal symptoms develop in an estimated 55-95% of opioid-exposed infants".

[3]: Based on average cost of Nurse-Family Partnership (NFP) program per family, as reported by HHS Administration for Children & Families.

[4]=([2]*[3])/10^3. Year 1 onwards grown at projected medical services inflation.

[5]=[4].

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Table C.7

Estimated Cost of Special Populations: Jails, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<u>Comprehensive treatment & re-entry facility</u>	<u>2019\$ [A]</u>															
[1]	Average daily population	2,263															
[2]	% of inmates with OUD	25.0%															
[3]	% of OUD inmates housed in facility	66.7%															
[4]	Average daily population with OUD	377															
[5]	Estimated facility cost per bed per day	\$33.48															
[6]	Cost of facility (\$000s)	\$4,606	\$4,726	\$4,849	\$4,970	\$5,094	\$5,217	\$5,337	\$5,459	\$5,585	\$5,714	\$5,851	\$5,991	\$6,135	\$6,282	\$6,433	\$6,587
	<u>Connect inmates with OUD to resources</u>	<u>2019\$ [B]</u>															
[7]	Annual # of releases	27,381															
[8]	Annual # of releases, inmates with OUD	6,845															
[9]	Daily releases with OUD, avg	19															
[10]	Daily releases with OUD per social worker, avg	2															
[11]	Required social workers for OUD inmates	9															
[12]	FTE salary estimate	\$60,500															
[13]	Salary cost (\$000s)	\$545	\$564	\$584	\$603	\$623	\$642	\$662	\$682	\$703	\$725	\$747	\$769	\$793	\$817	\$842	\$868
	<u>Labor Cost</u>																
	<u>Estimated employment cost</u>	<u>Multiplier [C]</u>															
[14]	FTE employment cost, base case (\$000s)	1.75x	\$987	\$1,022	\$1,056	\$1,090	\$1,124	\$1,159	\$1,194	\$1,230	\$1,268	\$1,307	\$1,346	\$1,388	\$1,430	\$1,474	\$1,518
	<u>Transitional housing for inmates with OUD</u>	<u>2019\$ [D]</u>															
[15]	Annual # of releases, inmates with OUD	6,845															
[16]	% receiving transitional housing	20.0%															
[17]	Annual # receiving housing	1,369															
[18]	Avg # of days in transitional housing	90															
[19]	Daily cost of transitional housing	\$47															
[20]	Housing cost (\$000s)	\$5,806	\$5,957	\$6,112	\$6,264	\$6,421	\$6,575	\$6,726	\$6,881	\$7,039	\$7,201	\$7,374	\$7,551	\$7,732	\$7,918	\$8,108	\$8,302
	<u>Specialty detox and treatment unit</u>	<u>2019\$ [E]</u>															
[21]	Annual cost of specialty detox unit (\$000s)	\$712	\$731	\$750	\$768	\$788	\$806	\$825	\$844	\$863	\$883	\$904	\$926	\$948	\$971	\$994	\$1,018
	<u>Total cost for special population</u>	<u>2020-2034 [F]</u>															
[22]	Base case (\$000s)	\$222,005	\$12,400	\$12,732	\$13,059	\$13,393	\$13,723	\$14,047	\$14,378	\$14,718	\$15,066	\$15,436	\$15,815	\$16,203	\$16,601	\$17,009	\$17,426

CONFIDENTIAL**APPENDIX D****Table C.7****Estimated Cost of Special Populations: Jails, Cuyahoga County****Sources and Notes:**

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[F]=Σ(Year 1 to Year 15).

[1], [6]: Cuyahoga County Sheriff's Department, 2017 Annual Report at p. 6.

[2]: From 2016 to 2018, between 24.7% and 29.6% of Common Pleas Court defendants had OUD (CUYAH_003505168-169).

[3]: Assumes that 2/3 of inmates with OUD are placed in comprehensive treatment and re-entry facility.

[4]=[1]*[2]*[3].

[5]: Estimated based on reported costs for the 175-bed comprehensive program center at Euclid Jail (CUYAH_012341077).

[6]: [6A]=([4]*[5]*365)/10³. Year 1 onwards grown at projected inflation.

[8]=[7]*[2].

[9]=[8]/365 days.

[11]=[9]/[10].

[12]: Salary estimated based on Cuyahoga County salary data for comparable employee types. (CUYAH_002426286)

[13]=([11]*[12])/10³. Year 1 onwards grown at employment cost inflation.

[14]=[13]*[C].

[15]=[8].

[17]=[15]*[16].

[18]: A 2017 data analysis prepared for the Ohio Development Services Agency and Ohio Mental Health and Addiction Services concluded that the optimal length of stay in transitional housing was 90 days.

[19]: Estimated based on 2019 fair market rents published by HUD and HUD research finding that transitional housing for individuals is ~211% of fair market rent for a 1-bedroom rental unit.

[20]: [20D]=([17]*[18]*[19])/10³. Year 1 onwards grown at projected inflation.

[21]: Estimated based on the inflation-adjusted annual cost of the Louisville Metro Corrections detox unit program. Year 1 onward grown at projected inflation.

[22]=[6]+[14]+[20]+[21].

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Table S.7

Estimated Cost of Special Populations: Jails, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Comprehensive treatment & re-entry facility</i>	<i>2019\$ [A]</i>															
[1]	Average daily population	647															
[2]	% of inmates with OUD	25.0%															
[3]	% of OUD inmates housed in facility	100.0%															
[4]	Average daily population with OUD	162															
[5]	Estimated facility cost per bed per day	\$33.48															
[6]	Cost of facility (\$000s)	\$1,976	\$2,028	\$2,080	\$2,132	\$2,186	\$2,238	\$2,290	\$2,342	\$2,396	\$2,451	\$2,510	\$2,570	\$2,632	\$2,695	\$2,760	\$2,826
	<i>Connect inmates with OUD to resources</i>	<i>2019\$ [B]</i>															
[7]	Annual # of releases	11,199															
[8]	Annual # of releases, inmates with OUD	2,800															
[9]	Daily releases with OUD, avg	8															
[10]	Daily releases with OUD per social worker, avg	2															
[11]	Required social workers for OUD inmates	4															
[12]	FTE salary estimate	\$60,500															
[13]	Salary cost (\$000s)	\$232	\$240	\$249	\$257	\$265	\$274	\$282	\$291	\$300	\$309	\$318	\$328	\$338	\$348	\$359	\$370
	<i>Labor Cost</i>																
	<i>Estimated employment cost</i>	<i>Multiplier [C]</i>															
[14]	FTE employment cost, base case (\$000s)	1.75x	\$420	\$435	\$450	\$465	\$479	\$494	\$509	\$524	\$540	\$557	\$574	\$591	\$609	\$628	\$647
	<i>Transitional housing for inmates with OUD</i>	<i>2019\$ [D]</i>															
[15]	Annual # of releases, inmates with OUD	2,800															
[16]	% receiving transitional housing	20.0%															
[17]	Annual # receiving housing	560															
[18]	Avg # of days in transitional housing	90															
[19]	Daily cost of transitional housing	\$43															
[20]	Housing cost (\$000s)	\$2,182	\$2,239	\$2,297	\$2,354	\$2,413	\$2,471	\$2,528	\$2,586	\$2,646	\$2,706	\$2,771	\$2,838	\$2,906	\$2,976	\$3,047	\$3,120
	<i>Total cost for special population</i>	<i>2020-2034 [E]</i>															
[21]	Base case (\$000s)	\$83,960	\$4,687	\$4,813	\$4,937	\$5,063	\$5,188	\$5,311	\$5,437	\$5,566	\$5,698	\$5,838	\$5,982	\$6,129	\$6,280	\$6,435	\$6,594

CONFIDENTIAL**APPENDIX D****Table S.7****Estimated Cost of Special Populations: Jails, Summit County****Sources and Notes:**

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[E]= Σ (Year 1 to Year 15).

[1], [6]: Summit County Sheriff's Office, 2017 Annual Report at p. 49.

[2]=Table C.7[2].

[3]: Assumes that all inmates with OUD are placed in a comprehensive treatment and re-entry facility.

[4]=[1]*[2]*[3].

[5]=Table C.7[5].

[6]: $[6A]=([4]*[5]*365)/10^3$. Year 1 onwards grown at projected inflation.

[8]=[7]*[2].

[9]=[8]/365 days.

[11]=[9]/[10].

[12]=Table C.7[12].

[13]=([11]*[12])/10³. Year 1 onwards grown at employment cost inflation.

[14]=[13]*[C].

[15]=[8].

[17]=[15]*[16].

[18]: A 2017 data analysis prepared for the Ohio Development Services Agency and Ohio Mental Health and Addiction Services concluded that the optimal length of stay in transitional housing was 90 days.

[19]: Estimated based on 2019 fair market rents published by HUD and HUD research finding that transitional housing for individuals is ~211% of fair market rent for a 1-bedroom rental unit.

[20]: $[20D]=([17]*[18]*[19])/10^3$. Year 1 onwards grown at projected inflation.

[21]=[6]+[14]+[20].

APPENDIX D: HARM REDUCTION

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Table C.8

Estimated Cost of Naloxone, Cuyahoga County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population requiring Narcan kits</i>																
[1]	Population requiring Narcan kits, low case	15,167	15,059	14,950	14,842	14,734	14,625	14,517	14,409	14,300	14,192	14,084	13,975	13,867	13,759	13,650
[2]	Population requiring Narcan kits, base case	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167	15,167
[3]	Population requiring Narcan kits, high case	15,167	15,275	15,384	15,492	15,600	15,709	15,817	15,925	16,034	16,142	16,250	16,359	16,467	16,575	16,684
<i>Estimated cost of Narcan kits</i>																
		<i>2019\$ [A]</i>														
[4]	Wholesale price \$111 / kit	\$116	\$122	\$128	\$134	\$140	\$147	\$153	\$160	\$167	\$175	\$183	\$191	\$200	\$209	\$219
[5]	Average # per person per year	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
[6]	Average cost per person per year	\$116	\$244	\$256	\$268	\$281	\$293	\$306	\$320	\$334	\$349	\$366	\$383	\$400	\$419	\$438
<i>Salary cost of distributing kits</i>																
		<i>2019\$ [B]</i>														
[7]	Distribution program administrators 2															
[8]	Estimated FTE salary \$55,500															
[9]	Salary cost (\$000)	\$111	\$115	\$119	\$123	\$127	\$131	\$135	\$139	\$143	\$148	\$152	\$157	\$162	\$167	\$172
<i>Labor Cost</i>																
		<i>Multiplier [C]</i>														
[10]	FTE employment cost, base case (\$000s) 1.75x	\$201	\$208	\$215	\$222	\$229	\$236	\$243	\$251	\$258	\$266	\$274	\$283	\$291	\$300	\$310
<i>Total cost of Narcan kits</i>																
		<i>2020-2034 [D]</i>														
[11]	Low case (\$000s)	\$72,021	\$1,963	\$3,882	\$4,039	\$4,201	\$4,363	\$4,522	\$4,686	\$4,857	\$5,033	\$5,225	\$5,423	\$5,629	\$5,842	\$6,064
[12]	Base case (\$000s)	\$76,169	\$1,963	\$3,908	\$4,094	\$4,289	\$4,484	\$4,681	\$4,885	\$5,099	\$5,322	\$5,565	\$5,819	\$6,085	\$6,363	\$6,653
[13]	High case (\$000s)	\$80,317	\$1,963	\$3,935	\$4,150	\$4,376	\$4,606	\$4,839	\$5,084	\$5,342	\$5,612	\$5,906	\$6,215	\$6,541	\$6,883	\$7,243
<i>Naloxone for first responders</i>																
		<i>2019\$ [E]</i>														
[14]	Average price per dose \$43 / dose	\$46	\$48	\$50	\$53	\$55	\$57	\$60	\$63	\$66	\$69	\$72	\$75	\$79	\$82	\$86
[15]	Naloxone purchased 12,082 doses															
[16]	Cost of Naloxone purchased \$524,283															
[17]	Naloxone doses purchased for first responders, low case	12,082	10,572	9,062	7,551	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041
[18]	Naloxone doses purchased for first responders, base case	12,082	11,327	10,572	9,817	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062
[19]	Naloxone doses purchased for first responders, high case	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082
<i>Total cost for first responders</i>																
		<i>2020-2034 [F]</i>														
[20]	Low case (\$000s)	\$6,517	\$551	\$506	\$455	\$397	\$333	\$347	\$363	\$379	\$396	\$414	\$433	\$453	\$474	\$496
[21]	Base case (\$000s)	\$9,053	\$551	\$542	\$530	\$516	\$499	\$521	\$544	\$568	\$594	\$621	\$650	\$680	\$712	\$745
[22]	High case (\$000s)	\$11,588	\$551	\$578	\$606	\$636	\$665	\$695	\$726	\$758	\$791	\$828	\$867	\$907	\$949	\$993

CONFIDENTIAL**APPENDIX D****Table C.8****Estimated Cost of Naloxone, Cuyahoga County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D],[F]= Σ (Year 1 to Year 15).

[1]-[3]: Year 1 from Table C.0[6]. Base case projects that the population requiring Narcan kits remains constant, high case projects that it increases by 10%, and low case projects that it decreases by 10%.

[4]: [4A] estimated based on the wholesale price for Narcan nasal spray kit (containing 2 doses) paid by Cleveland EMS in October and November of 2017. CLEVE_001627553. Year 1 onwards grown at prescription drug price inflation.

[5]: Projects the distribution of one kit per person requiring Narcan kits in Year 1, increasing to two kits distributed per individual by Year 2.

[6]=[4]*[5].

[8]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[9]: [9B]=([7]*[8])/10³. Year 1 onwards grown at projected employment cost inflation.

[10]=[9]*[C].

[11]=([1]*[6])/10³+ [10].[12]=([2]*[6])/10³+ [10].[13]=([3]*[6])/10³+ [10].

[14]: [E14] estimated based on the actual average price per dose of Naloxone purchased by Cleveland EMS in 2017. CLEVE_001627553. Year 1 onwards grown at prescription drug price inflation.

[15]: Based on the actual number of doses purchased by Cleveland EMS in 2017. CLEVE_001627553.

[16]=[14]*[15].

[17]-[19]: Year 1 from [15]. High case projects that the doses purchased for first responders remains constant, base case projects a 25% decline by Year 5, and low case projects a 50% decline by Year 5.

[20]=([17]*[14])/10³.[21]=([18]*[14])/10³.[22]=([19]*[14])/10³.

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Table S.8

Estimated Cost of Naloxone, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population requiring Narcan kits</i>																
[1]	Population requiring Narcan kits, low case	6,576	6,529	6,482	6,435	6,388	6,341	6,294	6,247	6,200	6,153	6,106	6,059	6,012	5,965	5,918
[2]	Population requiring Narcan kits, base case	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576
[3]	Population requiring Narcan kits, high case	6,576	6,623	6,670	6,717	6,764	6,810	6,857	6,904	6,951	6,998	7,045	7,092	7,139	7,186	7,233
<i>Estimated cost of Narcan kits</i>																
		<i>2019\$ [A]</i>														
[4]	Wholesale price \$111 / kit	\$116	\$122	\$128	\$134	\$140	\$147	\$153	\$160	\$167	\$175	\$183	\$191	\$200	\$209	\$219
[5]	Average # per person per year	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
[6]	Average cost per person per year	\$116	\$244	\$256	\$268	\$281	\$293	\$306	\$320	\$334	\$349	\$366	\$383	\$400	\$419	\$438
<i>Salary cost of distributing kits</i>																
		<i>2019\$ [B]</i>														
[7]	Distribution program administrators 2															
[8]	Estimated FTE salary \$55,500															
[9]	Salary cost (\$000)	\$111	\$115	\$119	\$123	\$127	\$131	\$135	\$139	\$143	\$148	\$152	\$157	\$162	\$167	\$172
<i>Labor Cost</i>																
		<i>Multiplier [C]</i>														
[10]	FTE employment cost, base case (\$000s) 1.75x	\$201	\$208	\$215	\$222	\$229	\$236	\$243	\$251	\$258	\$266	\$274	\$283	\$291	\$300	\$310
<i>Total cost of Narcan kits</i>																
		<i>2020-2034 [D]</i>														
[11]	Low case (\$000s)	\$33,372	\$965	\$1,801	\$1,873	\$1,947	\$2,021	\$2,094	\$2,170	\$2,248	\$2,328	\$2,416	\$2,507	\$2,601	\$2,698	\$2,799
[12]	Base case (\$000s)	\$35,170	\$965	\$1,812	\$1,897	\$1,985	\$2,074	\$2,163	\$2,256	\$2,353	\$2,454	\$2,564	\$2,678	\$2,798	\$2,924	\$3,055
[13]	High case (\$000s)	\$36,968	\$965	\$1,824	\$1,921	\$2,023	\$2,127	\$2,232	\$2,342	\$2,458	\$2,579	\$2,711	\$2,850	\$2,996	\$3,149	\$3,311
<i>Naloxone for first responders</i>																
		<i>2019\$ [E]</i>														
[14]	Average price per dose \$43 / dose	\$46	\$48	\$50	\$53	\$55	\$57	\$60	\$63	\$66	\$69	\$72	\$75	\$79	\$82	\$86
[15]	Naloxone purchased 5,238 doses															
[16]	Cost of Naloxone purchased \$227,302															
[17]	Naloxone doses purchased for first responders, low case	5,238	4,583	3,929	3,274	2,619	2,619	2,619	2,619	2,619	2,619	2,619	2,619	2,619	2,619	2,619
[18]	Naloxone doses purchased for first responders, base case	5,238	4,911	4,583	4,256	3,929	3,929	3,929	3,929	3,929	3,929	3,929	3,929	3,929	3,929	3,929
[19]	Naloxone doses purchased for first responders, high case	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238	5,238
<i>Total cost for first responders</i>																
		<i>2020-2034 [F]</i>														
[20]	Low case (\$000s)	\$2,826	\$239	\$219	\$197	\$172	\$144	\$151	\$157	\$164	\$172	\$180	\$188	\$197	\$206	\$215
[21]	Base case (\$000s)	\$3,925	\$239	\$235	\$230	\$224	\$216	\$226	\$236	\$246	\$257	\$269	\$282	\$295	\$309	\$323
[22]	High case (\$000s)	\$5,024	\$239	\$251	\$263	\$276	\$288	\$301	\$315	\$329	\$343	\$359	\$376	\$393	\$411	\$431

CONFIDENTIAL**APPENDIX D****Table S.8****Estimated Cost of Naloxone, Summit County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D],[F]= Σ (Year 1 to Year 15).

[1]-[3]: Year 1 from Table S.0[6]. Base case projects that the population requiring Narcan kits remains constant, high case projects that it increases by 10%, and low case projects that it decreases by 10%.

[4]=Table C.8[4].

[5]: Projects the distribution of one kit per person requiring Narcan kits in Year 1, increasing to two kits distributed per individual by Year 2.

[6]=[4]*[5].

[8]=Table C.8[8].

[9]: [9B]=([7]*[8])/10³. Year 1 onwards grown at projected employment cost inflation.

[10]=[9]*[C].

[11]=([1]*[6])/10³+ [10].[12]=([2]*[6])/10³+ [10].[13]=([3]*[6])/10³+ [10].

[14]=Table C.8[14].

[15]=Table C.8[15]*(Table S.0[2]/Table C.0[2]).

[16]=[14]*[15].

[17]-[19]: Year 1 from [15]. High case projects that the doses purchased for first responders remains constant, base case projects a 25% decline by Year 5, and low case projects a 50% decline by Year 5.

[20]=([17]*[14])/10³.[21]=([18]*[14])/10³.[22]=([19]*[14])/10³.

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Table C.9

Estimated Cost of Syringe Exchange Program, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>2019\$ [A]</i>															
[1]	Monthly average # of syringes provided	41,250														
[2]	ODU % of program clients	67.4%														
[3]	Monthly avg # of syringes provided to OUD individ.	27,787														
	<i># of syringes to provide</i>															
[4]	Syringes provided per month, low case	34,734	41,680	41,680	41,680	41,680	41,264	40,847	40,430	40,013	39,596	39,180	38,763	38,346	37,929	37,512
[5]	Syringes provided per month, base case	34,734	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680
[6]	Syringes provided per month, high case	34,734	41,680	41,680	41,680	41,680	42,097	42,514	42,931	43,348	43,764	44,181	44,598	45,015	45,432	45,848
	<i>Cost of exchange program per syringe</i>	<i>2019\$ [B]</i>														
[7]	Program cost per syringe distributed	\$1.25	\$1.28	\$1.32	\$1.35	\$1.38	\$1.42	\$1.45	\$1.48	\$1.52	\$1.55	\$1.59	\$1.63	\$1.66	\$1.70	\$1.75
	<i>Total cost of exchange program</i>	<i>2020-2034 [C]</i>														
[8]	Low case (\$000s)	\$10,867	\$535	\$658	\$675	\$691	\$708	\$717	\$726	\$735	\$744	\$754	\$764	\$774	\$784	\$795
[9]	Base case (\$000s)	\$11,325	\$535	\$658	\$675	\$691	\$708	\$724	\$741	\$758	\$775	\$794	\$813	\$833	\$853	\$873
[10]	High case (\$000s)	\$11,784	\$535	\$658	\$675	\$691	\$708	\$732	\$756	\$781	\$806	\$834	\$862	\$891	\$921	\$952

CONFIDENTIAL**APPENDIX D****Table C.9****Estimated Cost of Syringe Exchange Program, Cuyahoga County**

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]= Σ (Year 1 to Year 15).

[1]: Equal to the average # of syringes distributed in the year ended June 30, 2016. Circle Health Services, Form 990 for the year ended June 30, 2016 at 44.

[2]=Table S.9[2].

[3]=[1]*[2].

[4]-[6]: All cases assume the number of syringes provided to individuals with OUD increases by 50% by Year 2. Base case assumes the number of syringes provided to individuals with OUD remains constant after Year 2, low case assumes a decline of 10%, and high case assumes an increase of 10%.

[7]: Cost based on the operating costs reported by Cleveland's Circle Health Services (Form 990 for the year ended June 30, 2016 at p. 44) and a study reporting the average cost per syringe distributed in exchange programs (Lurie P, Gorsky R, Jones TS et al. (1998)). Year 1 onwards grown at projected inflation.

[8]=([4]*12*[7])/10³.

[9]=([5]*12*[7])/10³.

[10]=([6]*12*[7])/10³.

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Table S.9

Estimated Cost of Syringe Exchange Program, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>2019\$ [A]</i>															
[1]	Monthly average # of syringes provided	24,225														
[2]	OUD % of program clients	67.4%														
[3]	Monthly avg # of syringes provided to OUD individ.	16,318														
	<i># of syringes to provide</i>															
[4]	Syringes provided per month, low case	21,758	27,197	27,197	27,197	27,197	26,925	26,654	26,382	26,110	25,838	25,566	25,294	25,022	24,750	24,478
[5]	Syringes provided per month, base case	21,758	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197
[6]	Syringes provided per month, high case	21,758	27,197	27,197	27,197	27,197	27,469	27,741	28,013	28,285	28,557	28,829	29,101	29,373	29,645	29,917
	<i>Cost of exchange program per syringe</i>	<i>2019\$ [B]</i>														
[7]	Program cost per syringe distributed	\$1.25	\$1.28	\$1.32	\$1.35	\$1.38	\$1.42	\$1.45	\$1.48	\$1.52	\$1.55	\$1.59	\$1.63	\$1.66	\$1.70	\$1.75
	<i>Total cost of exchange program</i>	<i>2020-2034 [C]</i>														
[8]	Low case (\$000s)	\$7,077	\$335	\$429	\$440	\$451	\$462	\$468	\$474	\$480	\$486	\$492	\$499	\$505	\$512	\$518
[9]	Base case (\$000s)	\$7,376	\$335	\$429	\$440	\$451	\$462	\$473	\$484	\$495	\$506	\$518	\$531	\$543	\$556	\$570
[10]	High case (\$000s)	\$7,675	\$335	\$429	\$440	\$451	\$462	\$477	\$493	\$509	\$526	\$544	\$562	\$581	\$601	\$621

CONFIDENTIAL**APPENDIX D****Table S.9****Estimated Cost of Syringe Exchange Program, Summit County**

Sources and Notes:

See Table I for actual and projected inflation rates used.[C]= Σ (Year 1 to Year 15).[1]: Actual monthly average # of syringes distributed in January and February 2019. (<https://www.scph.org/dashboards>)

[2]: Based on the % of clients of the Summit County syringe exchange program reporting heroin, fentanyl or opioid use in January-February 2019.

[3]=[1]*[2].

[4]-[6]: All cases assume the number of syringes provided to individuals with OUD increases by ~66% by Year 2. Base case assumes the number of syringes provided to individuals with OUD remains constant after Year 2, low case assumes a decline of 10% beginning in Year 6, and high case assumes an increase of 10% beginning in Year 6.

[7]: Cost based on the operating costs reported by Cleveland's Circle Health Services (Form 990 for the year ended June 30, 2016 at p. 44) and a study reporting the average cost per syringe distributed in exchange programs (Lurie P, Gorsky R, Jones TS et al. (1998)). Year 1 onwards grown at projected inflation.

[8]=([4]*12*[7])/10³.[9]=([5]*12*[7])/10³.[10]=([6]*12*[7])/10³.

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Table C.10

Estimated Cost of HIV and HCV Treatment, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>HIV treatment costs</i>		<i>2019\$ [A]</i>														
[1]	Persons living with diagnosed HIV	4,940														
[2]	% infected via injection drug use	10.0%														
[3]	Opioid % of injection drug use	56.5%														
[4]	Current pop. with opioid-related HIV	279	275	270	266	262	258	254	250	246	242	238	234	231	227	224
[5]	Annual mortality risk	1.6%														
[6]	Annual cost of HIV treatment (\$000s)	\$30	\$31	\$33	\$34	\$36	\$37	\$39	\$40	\$42	\$44	\$46	\$48	\$50	\$52	\$54
[7]	Est. total HIV treatment cost (\$000s)	\$8,638	\$8,893	\$9,140	\$9,394	\$9,638	\$9,873	\$10,112	\$10,358	\$10,610	\$10,886	\$11,170	\$11,460	\$11,759	\$12,065	\$12,379
<i>HCV treatment costs</i>		<i>2019\$ [B]</i>														
[8]	Ratio of HCV-to-HIV prev. among IDUs	6.1														
[9]	Current pop. with opioid-related HCV	1,711	1,701	1,453	1,241	1,060	906	774	661	564	482	412	352	300	257	219
[10]	Annual mortality risk	0.6%														
[11]	% receiving treatment	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
[12]	# receiving treatment for HCV	255	218	186	159	136	116	99	85	72	62	53	45	38	33	28
[13]	% cured by treatment	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%
[14]	Cost of HCV treatment (\$000s)	\$24	\$25	\$26	\$28	\$29	\$30	\$32	\$33	\$35	\$36	\$38	\$40	\$42	\$43	\$45
[15]	Est. total HCV treatment costs (\$000s)	\$6,432	\$5,770	\$5,167	\$4,627	\$4,135	\$3,689	\$3,292	\$2,937	\$2,620	\$2,342	\$2,093	\$1,871	\$1,672	\$1,495	\$1,336
<i>Total cost of treating HIV/HCV</i>		<i>2020-2034 [C]</i>														
[16]	Base case (\$000s)	\$205,851	\$15,070	\$14,663	\$14,307	\$14,020	\$13,774	\$13,562	\$13,404	\$13,295	\$13,230	\$13,228	\$13,263	\$13,331	\$13,431	\$13,560

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Ohio Department of Public Health, Cuyahoga County HIV Surveillance Data Tables, July 20, 2018.

[2]: Between 2000 and 2015, injection drug users (IDUs) represented ~6 to ~15% of new HIV diagnoses. Dawson and Kates, "HIV and the Opioid Epidemic: 5 Key Points," KFF, March 27, 2018.

[3]=2,508 thousand persons with lifetime heroin injection / 4,442 thousand persons with lifetime injection drug use. 2017 NSDUH, Table 1.96A.

[4]: [4A]=[1]*[2]*[3]. Year 1 onwards decreased by annual mortality risk in [5].

[5]: The CDC reports that 1,008,929 people were living with diagnosed HIV infection in 2016 and that there were 15,807 deaths among people with diagnosed HIV in 2016.

[6]: The CDC reports that the average annual cost of HIV care was estimated to be \$23,000 in 2010\$. Year 1 onwards grown at projected medical services inflation.

[7]=[4]*[6]. These costs represent the cost to treat current opioid-related HIV infections. The future cost of treating new opioid-related cases would be additive to this estimate. The CDC reports that the estimated lifetime HIV treatment cost is \$379,668 in 2010\$.

[8]=55.2% prevalence of HCV among IDUs / 9.0% prevalence of HIV among IDUs. Degenhardt, Peacock, Colledge et al. (2017).

[9]: [9B]=[4]*[8]. Year 1 onwards decreased by annual mortality risk in [10] and by the rate of treatments leading to cure (e.g., [11]*[13]).

[11]: Assumed treatment pattern.

[12]=[9]*[11].

[13]: Clinical studies indicate that the cure rate for HCV treatments range from ~89% to ~99%.

[14]: Generic versions of most effective HCV drugs (Epclusa and Harvoni) became available in January 2019, \$24,000 is the list price for the most common course of treatment (12-weeks). Year 1 onwards grows at projected prescription drug inflation.

[15]=[12]*[14]. These costs represent the cost to treat current opioid-related HCV infections. The future cost of treating new opioid-related cases would be additive to this estimate.

[16]=[7]+[15].

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Table S.10

Estimated Cost of HIV and HCV Treatment, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>HIV treatment costs</i>		<i>2019\$ [A]</i>														
[1]	Persons living with diagnosed HIV	965														
[2]	% infected via injection drug use	10.0%														
[3]	Opioid % of injection drug use	56.5%														
[4]	Current pop. with opioid-related HIV	54	54	53	52	51	50	50	49	48	47	47	46	45	44	43
[5]	Annual mortality risk	1.6%														
[6]	Annual cost of HIV treatment (\$000s)	\$30	\$31	\$33	\$34	\$36	\$37	\$39	\$40	\$42	\$44	\$46	\$48	\$50	\$52	\$54
[7]	Est. total HIV treatment cost (\$000s)	\$1,687	\$1,737	\$1,785	\$1,835	\$1,883	\$1,929	\$1,975	\$2,023	\$2,073	\$2,127	\$2,182	\$2,239	\$2,297	\$2,357	\$2,418
<i>HCV treatment costs</i>		<i>2019\$ [A]</i>														
[8]	Ratio of HCV-to-HIV prev. among IDUs	6.1														
[9]	Current pop. with opioid-related HCV	334	332	284	242	207	177	151	129	110	94	80	69	59	50	43
[10]	Annual mortality risk	0.6%														
[11]	% receiving treatment	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
[12]	# receiving treatment for HCV	50	43	36	31	27	23	19	17	14	12	10	9	8	6	5
[13]	% cured by treatment	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%	94.0%
[14]	Cost of HCV treatment (\$000s)	\$24	\$25	\$26	\$28	\$29	\$30	\$32	\$33	\$35	\$36	\$38	\$40	\$42	\$43	\$45
[15]	Est. total HCV treatment costs (\$000s)	\$1,256	\$1,127	\$1,009	\$904	\$808	\$721	\$643	\$574	\$512	\$457	\$409	\$365	\$327	\$292	\$261
<i>Total cost of treating HIV/HCV</i>		<i>2020-2034 [C]</i>														
[16]	Base case (\$000s)	\$40,212	\$2,944	\$2,864	\$2,795	\$2,739	\$2,691	\$2,649	\$2,618	\$2,597	\$2,584	\$2,584	\$2,591	\$2,604	\$2,624	\$2,649

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Ohio Department of Public Health, Summit County HIV Surveillance Data Tables, July 20, 2018.

[2]: Between 2000 and 2015, injection drug users (IDUs) represented ~6 to ~15% of new HIV diagnoses. Dawson and Kates, "HIV and the Opioid Epidemic: 5 Key Points," KFF, March 27, 2018.

[3]=2,508 thousand persons with lifetime heroin injection / 4,442 thousand persons with lifetime injection drug use. 2017 NSDUH, Table 1.96A.

[4]: [4A]=[1]*[2]*[3]. Year 1 onwards decreased by annual mortality risk in [5].

[5]: The CDC reports that 1,008,929 people were living with diagnosed HIV infection in 2016 and that there were 15,807 deaths among people with diagnosed HIV in 2016.

[6]: The CDC reports that the average annual cost of HIV care was estimated to be \$23,000 in 2010\$. Year 1 onwards grown at projected medical services inflation.

[7]=[4]*[6]. These costs represent the cost to treat current opioid-related HIV infections. The future cost of treating new opioid-related cases would be additive to this estimate. The CDC reports that the estimated lifetime HIV treatment cost is \$379,668 in 2010\$.

[8]=55.2% prevalence of HCV among IDUs / 9.0% prevalence of HIV among IDUs. Degenhardt, Peacock, Colledge et al. (2017).

[9]: [9A]=[4]*[8]. Year 1 onwards decreased by annual mortality risk in [10] and by the rate of treatments leading to cure (e.g., [11]*[13]).

[11]: Assumed treatment pattern.

[12]=[9]*[11].

[13]: Clinical studies indicate that the cure rate for HCV treatments range from ~89% to ~99%.

[14]: Generic versions of most effective HCV drugs (Epclusa and Harvoni) became available in January 2019, \$24,000 is the list price for the most common course of treatment (12-weeks). Year 1 onwards grows at projected prescription drug inflation.

[15]=[12]*[14]. These costs represent the cost to treat current opioid-related HCV infections. The future cost of treating new opioid related cases would be additive to this estimate.

[16]=[7]+[15].

CONFIDENTIAL**APPENDIX D****Table C.11****Estimated Cost of Social Support Housing, Cuyahoga County**

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Transitional housing for homeless with OUD</i>	<i>2019\$ [A]</i>															
[1]	Avg # of homeless per night	1,808															
[2]	ODU prevalence among homeless	17.9%															
[3]	Avg # of homeless with OUD per night	324															
[4]	Annual cost of supportive housing unit	\$13,000															
[5]	Housing cost (\$000s)	\$4,212	\$4,322	\$4,434	\$4,545	\$4,658	\$4,770	\$4,880	\$4,992	\$5,107	\$5,224	\$5,350	\$5,478	\$5,610	\$5,744	\$5,882	\$6,023
	<i>Total cost for transitional housing</i>	<i>2020-2034 [B]</i>															
[6]	Base case (\$000s)	\$77,019	\$4,322	\$4,434	\$4,545	\$4,658	\$4,770	\$4,880	\$4,992	\$5,107	\$5,224	\$5,350	\$5,478	\$5,610	\$5,744	\$5,882	\$6,023

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]=Σ(Year 1 to Year 15).

[1]: Point-in-time estimate of homelessness in Cuyahoga County in 2018. HUD Homelessness Data Exchange.

[2]: Based on national prevalence of OUD among homeless veterans. Iheanacho, Stefanovics, & Rosenheck (2018): "Altogether, 17.9 percent of homeless VHA users were diagnosed with OUD."

[3]=[1]*[2].

[4]: Estimated based on 2019 fair market rents published by HUD and HUD research finding that permanent supportive housing for individuals is ~144% of fair market rent for a 1-bedroom rental unit and for families is ~134% of fair market rent for a 2-bedroom rental unit. Calculation assumes that half of supportive housing units are for individuals and half are for families.

[5]: [5A]=([3]*[4])/10^3. Year 1 onwards grown at projected inflation.

[6]=[5].

CONFIDENTIAL**APPENDIX D****Table S.11****Estimated Cost of Social Support Housing, Summit County**

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Transitional housing for homeless with OUD</i>	<i>2019\$ [A]</i>															
[1]	Avg # of homeless per night	587															
[2]	ODU prevalence among homeless	17.9%															
[3]	Avg # of homeless with OUD per night	105															
[4]	Annual cost of supportive housing	\$12,500															
[5]	Housing cost (\$000s)	\$1,313	\$1,347	\$1,382	\$1,416	\$1,452	\$1,486	\$1,521	\$1,556	\$1,591	\$1,628	\$1,667	\$1,707	\$1,748	\$1,790	\$1,833	\$1,877
	<i>Total cost for transitional housing</i>	<i>2020-2034 [B]</i>															
[6]	Base case (\$000s)	\$24,000	\$1,347	\$1,382	\$1,416	\$1,452	\$1,486	\$1,521	\$1,556	\$1,591	\$1,628	\$1,667	\$1,707	\$1,748	\$1,790	\$1,833	\$1,877

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]=Σ(Year 1 to Year 15).

[1]: Point-in-time estimate of homelessness in Summit County in 2018. HUD Homelessness Data Exchange.

[2]: Based on national prevalence of OUD among homeless veterans. Iheanacho, Stefanovics, & Rosenheck (2018): "Altogether, 17.9 percent of homeless VHA users were diagnosed with OUD."

[3]=[1]*[2].

[4]: Estimated based on 2019 fair market rents published by HUD and HUD research finding that permanent supportive housing for individuals is ~144% of fair market rent for a 1-bedroom rental unit and for families is ~134% of fair market rent for a 2-bedroom rental unit. Calculation assumes that half of supportive housing units are for individuals and half are for families.

[5]: [5A]=([3]*[4])/10^3. Year 1 onwards grown at projected inflation.

[6]=[5].

APPENDIX D: PRIMARY PREVENTION

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Table C.12

Estimated Cost of Media Campaign, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Target population for campaign</i>	<i>July 1, 2017 [A]</i>															
[1]	12-25 year old population	220,086	220,086	219,371	218,658	217,947	217,239	216,533	215,829	215,128	214,429	213,732	213,037	212,345	211,655	210,967	210,281
	<i>Estimated cost of campaign</i>	<i>2019\$ [B]</i>															
[2]	Per targeted individual	\$0.40 / month	\$0.41	\$0.42	\$0.44	\$0.45	\$0.46	\$0.47	\$0.48	\$0.49	\$0.50	\$0.51	\$0.53	\$0.54	\$0.55	\$0.56	\$0.58
[3]	# of months of campaign will run	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
[4]	Estimated cost per target per year	\$2.49	\$5.10	\$5.23	\$5.36	\$5.49	\$5.61	\$5.74	\$5.87	\$6.01	\$6.15	\$6.30	\$6.45	\$6.61	\$6.77	\$6.93	
	<i>Total cost of campaign</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$18,485	\$547	\$1,119	\$1,143	\$1,168	\$1,192	\$1,215	\$1,239	\$1,264	\$1,288	\$1,315	\$1,342	\$1,370	\$1,398	\$1,427	\$1,457

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 to 25 years old, Cuyahoga County.

[C]=Σ(Year 1 to Year 15).

[1]: Target audience based on Georgia's "Generation Rx" campaign, which aims to prevent the misuse/abuse of prescription drugs among 12-25 year olds. Growth after Year 1 projected based on county population projections published by the Ohio Development Services Agency.

[2]: [2B] estimated based on the FDA's "The Real Cost" anti-smoking campaign. Mac Monegle et al (2018). Year 1 onwards grown at projected inflation.

[3]: Projects that media campaign will be launched by second half of Year 1.

[4]=[2]*[3].

[5]=([1]*[4])/10^3.

CONFIDENTIAL**APPENDIX D****Table S.12****Estimated Cost of Media Campaign, Summit County**

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Target population for campaign</i>	<i>July 1, 2017 [A]</i>															
[1]	12-25 year old population	94,300	94,300	94,248	94,196	94,144	94,092	94,040	93,988	93,936	93,884	93,832	93,780	93,728	93,676	93,624	93,572
	<i>Estimated cost of campaign</i>	<i>2019\$ [B]</i>															
[2]	Per targeted individual	\$0.40 / month	\$0.41	\$0.42	\$0.44	\$0.45	\$0.46	\$0.47	\$0.48	\$0.49	\$0.50	\$0.51	\$0.53	\$0.54	\$0.55	\$0.56	\$0.58
[3]	# of months of campaign will run	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
[4]	Estimated cost per target per year	\$2.49	\$5.10	\$5.23	\$5.36	\$5.49	\$5.61	\$5.74	\$5.87	\$6.01	\$6.15	\$6.30	\$6.45	\$6.61	\$6.77	\$6.93	\$6.93
	<i>Total cost of campaign</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$8,085	\$234	\$481	\$492	\$504	\$516	\$528	\$540	\$552	\$564	\$577	\$591	\$605	\$619	\$633	\$648

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 to 25 years old, Summit County.

[C]=Σ(Year 1 to Year 15).

[1]: Target audience based on Georgia's "Generation Rx" campaign, which aims to prevent the misuse/abuse of prescription drugs among 12-25 year olds. Growth after Year 1 projected based on county population projections published by the Ohio Development Services Agency.

[2]: [2B] estimated based on the FDA's "The Real Cost" anti-smoking campaign. Mac Monegle et al (2018). Year 1 onwards grown at projected inflation.

[3]: Projects that media campaign will be launched by second half of Year 1.

[4]=[2]*[3].

[5]=([1]*[4])/10^3.

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Table C.13

Estimated Cost of School-Based Prevention, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Salary cost of personnel</i>	<i>2019\$ [A]</i>														
[1]	# of social workers required to help students affected by opioid crisis	106														
[2]	FTE salary estimate	\$45,000														
[3]	Salary cost (\$000s)	\$4,770	\$4,939	\$5,114	\$5,285	\$5,457	\$5,628	\$5,800	\$5,977	\$6,159	\$6,347	\$6,541	\$6,740	\$6,946	\$7,158	\$7,376
	<i>Estimated employment cost</i>	<i>Labor Cost Multiplier [B]</i>														
[4]	FTE employment cost, base case (\$000s)	1.75x	\$8,643	\$8,949	\$9,249	\$9,549	\$9,850	\$10,150	\$10,460	\$10,779	\$11,108	\$11,447	\$11,796	\$12,156	\$12,526	\$12,908
	<i>Estimated cost of curriculum</i>	<i>2019\$ [C]</i>														
[5]	Cost of prevention curriculum per pupil	\$52														
[6]	# of students, grades 6-12	106,380														
[7]	Cost of prevention curriculum (\$000s)	\$5,532	\$5,676	\$5,823	\$5,969	\$6,118	\$6,265	\$6,409	\$6,556	\$6,707	\$6,861	\$7,026	\$7,195	\$7,367	\$7,544	\$7,725
	<i>Estimated total cost</i>	<i>2020-2034 [D]</i>														
[8]	Base case (\$000s)	\$264,023	\$14,319	\$14,773	\$15,218	\$15,667	\$16,115	\$16,559	\$17,016	\$17,486	\$17,969	\$18,473	\$18,990	\$19,523	\$20,070	\$21,213

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[1]: Estimated based on public and private school enrollment data from the National Center for Education Statistics and the assumption that approximately 25% of students have more intensive needs due to the opioid crisis. The recommended student-social worker ratio is lower for students with intensive needs. National Association of Social Workers, Standards for School Social Work Services (2012) at p.18: "School social work services should be provided at a ratio of one school social worker to each school building serving up to 250 general education students, or a ratio of 1:250 students. When a school social worker is providing services to students with intensive needs, a lower ratio, such as 1:50, is suggested."

[2]: Salary estimated based on the salary range for school counselors in the Cleveland area reported by Glassdoor.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]: Estimate based on SAMSHA/HHS study, which found that Youth Substance Abuse Prevention Programs cost on average \$52/pupil for materials and training. SAMSHA/HHS, "Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis," Table A4: Estimated Program Costs by Component (in 2002 dollars).

[6]: Public and private school enrollment data from the National Center for Education Statistics.

[7]: [7C]=([5]*[6])/10^3. Year 1 onwards grown at projected inflation.

[8]=[4]+[7].

CONFIDENTIAL**APPENDIX D****Table S.13****Estimated Cost of School-Based Prevention, Summit County**

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Salary cost of personnel</i>	<i>2019\$ [A]</i>														
[1]	# of social workers required to help students affected by opioid crisis	46														
[2]	FTE salary estimate	\$45,000														
[3]	Salary cost (\$000s)	\$2,070	\$2,143	\$2,219	\$2,293	\$2,368	\$2,443	\$2,517	\$2,594	\$2,673	\$2,754	\$2,839	\$2,925	\$3,014	\$3,106	\$3,201
																\$3,299
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>														
[4]	FTE employment cost, base case (\$000s)	1.75x	\$3,751	\$3,884	\$4,014	\$4,144	\$4,274	\$4,405	\$4,539	\$4,678	\$4,820	\$4,967	\$5,119	\$5,275	\$5,436	\$5,602
																\$5,773
	<i>Estimated cost of curriculum</i>	<i>2019\$ [C]</i>														
[5]	Cost of prevention curriculum per pupil	\$52														
[6]	# of students, grades 6-12	45,599														
[7]	Cost of prevention curriculum (\$000s)	\$2,371	\$2,433	\$2,496	\$2,558	\$2,622	\$2,685	\$2,747	\$2,810	\$2,875	\$2,941	\$3,012	\$3,084	\$3,158	\$3,234	\$3,311
																\$3,391
	<i>Estimated total cost</i>	<i>2020-2034 [D]</i>														
[8]	Base case (\$000s)	\$114,038	\$6,184	\$6,380	\$6,572	\$6,766	\$6,960	\$7,152	\$7,349	\$7,553	\$7,761	\$7,979	\$8,203	\$8,433	\$8,670	\$9,163

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[1]: Estimated based on public and private school enrollment data from the National Center for Education Statistics and the assumption that approximately 25% of students have more intensive needs due to the opioid crisis. The recommended student-social worker ratio is lower for students with intensive needs. National Association of Social Workers, Standards for School Social Work Services (2012) at p.18: "School social work services should be provided at a ratio of one school social worker to each school building serving up to 250 general education students, or a ratio of 1:250 students. When a school social worker is providing services to students with intensive needs, a lower ratio, such as 1:50, is suggested."

[2]: Salary estimated based on the salary range for school counselors in the Akron area reported by Glassdoor.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]: Estimate based on SAMSHA/HHS study, which found that Youth Substance Abuse Prevention Programs cost on average \$52/pupil for materials and training. SAMSHA/HHS, "Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis," Table A4: Estimated Program Costs by Component (in 2002 dollars).

[6]: Public and private school enrollment data from the National Center for Education Statistics.

[7]: [7C]=([5]*[6])/10^3. Year 1 onwards grown at projected inflation.

[8]=[4]+[7].

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Table C.14

Estimated Cost of Medical Provider Education and Outreach, Cuyahoga County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Education staffing requirements</i>	<i>2019\$ [A]</i>															
[1]	FTEs for medical provider outreach	3															
[2]	FTE salary estimate	\$66,000															
[3]	Salary cost (\$000s)	\$185	\$191	\$198	\$205	\$211	\$218	\$225	\$232	\$239	\$246	\$253	\$261	\$269	\$277	\$286	\$294
</																	

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Based on # of FTEs in county reported by Ohio Development Services Agency; assumption that ~10% of physicians will be targeted for education; and study of academic detailing visits (Barth, Ball, Adams, et al. (2017)).

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table S.14

Estimated Cost of Medical Provider Education and Outreach, Summit County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Education staffing requirements</i>	<i>2019\$ [A]</i>															
[1]	FTEs for medical provider outreach	1															
[2]	FTE salary estimate	\$66,000															
[3]	Salary cost (\$000s)	\$53	\$55	\$57	\$59	\$60	\$62	\$64	\$66	\$68	\$70	\$72	\$75	\$77	\$79	\$82	\$84

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Based on # of FTEs in county reported by Ohio Development Services Agency; assumption that ~10% of physicians will be targeted for education; and study of academic detailing visits (Barth, Ball, Adams, et al. (2017)).

[2]=Table C.14[2].

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table C.15

Estimated Cost of Drug Disposal Programs, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Drug disposal sites</i>															
	<i>2019\$ [A]</i>															
[1]	Current number of disposal sites	64														
[2]	Proposed program expansion	50.0%														
[3]	Proposed number of disposal sites	96														
[4]	Annual operating cost per disposal site	\$3,000														
[5]	Annual program cost (\$000s)	\$288	\$295	\$303	\$311	\$319	\$326	\$334	\$341	\$349	\$357	\$366	\$375	\$384	\$393	\$402
[6]	1x cost of program expansion (\$000s)	\$27	\$28													
	<i>Take-back event costs</i>															
	<i>2019\$ [B]</i>															
[7]	Number of drug take back events	48														
[8]	Cost per drug take back event	\$2,250														
[9]	Take-back event costs (\$000s)	\$108	\$112	\$116	\$120	\$124	\$127	\$131	\$135	\$139	\$144	\$148	\$153	\$157	\$162	\$167
[10]	FTEs to coordinate events	1														
[11]	FTE salary estimate	\$55,500														
[12]	Salary cost (\$000s)	\$56	\$57	\$60	\$61	\$63	\$65	\$67	\$70	\$72	\$74	\$76	\$78	\$81	\$83	\$86
	<i>Labor Cost</i>															
	<i>Multiplier [C]</i>															
[13]	FTE employment cost, base case (\$000s)	1.75x	\$101	\$104	\$108	\$111	\$115	\$118	\$122	\$125	\$129	\$133	\$137	\$141	\$146	\$150
[14]	Opioid % of medication take-backs	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%
	<i>Total cost of disposal programs</i>															
	<i>2020-2034 [D]</i>															
[15]	Base case (\$000s)	\$6,136	\$354	\$345	\$355	\$365	\$375	\$385	\$395	\$405	\$416	\$427	\$439	\$450	\$462	\$488

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[2]: A GAO report (GAO-18-25, October 2017) found that only 3% of pharmacies and other entities eligible to collect unused Rx drugs for disposal have volunteered to do so.

[3]=[1]*(1+[2]).

[4]: King County, WA estimated the cost of drug disposal program was \$7,188 per site (2018\$). Other disposal programs have indicated the cost per site is in the range of \$1,300 to \$2,800 (2018\$).

[5]: [5A]=([3]*[4])/10^3. Year 1 onwards grown at projected inflation.

[6]: [6A]=([3]-[1])*\$850 (cost of steel drug disposal boxes sold by NADDI). Year 1 grown at projected inflation.

[7]: Assumes one event per week, excluding holidays.

[8]: Average event cost of \$2,000 + average drug disposal cost of \$250 per event.

[9]: [9B]=([7]*[8])/10^3. Year 1 onwards grown at projected inflation.

[11]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[12]=([10]*[11])/10^3. Year 1 onwards grown at projected employment cost inflation.

[13]=[12]*[C].

[14]: Based on study finding that 66% of medications returned in take-back initiatives were opioids between 2011 and 2015. Jaramillo-Stametz, Stewart, Ochs et al. (2018).

[15]=[14]*([5]+[6]+[9]+[13]).

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		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Drug disposal sites</i>	<i>2019\$ [A]</i>														
[1]	Current number of disposal sites	20														
[2]	Proposed program expansion	50.0%														
[3]	Proposed number of disposal sites	30														
[4]	Annual operating cost per disposal site	\$3,000														
[5]	Annual program cost (\$000s)	\$90	\$92	\$95	\$97	\$100	\$102	\$104	\$107	\$109	\$112	\$114	\$117	\$120	\$123	\$129
[6]	1x cost of program expansion (\$000s)	\$9	\$9													
	<i>Take-back event costs</i>	<i>2019\$ [B]</i>														
[7]	Number of drug take back events	48														
[8]	Cost per drug take back event	\$2,250														
[9]	Take-back event costs (\$000s)	\$108	\$112	\$116	\$120	\$124	\$127	\$131	\$135	\$139	\$144	\$148	\$153	\$157	\$162	\$172
[10]	FTEs to coordinate events	1														
[11]	FTE salary estimate	\$55,500														
[12]	Salary cost (\$000s)	\$56	\$57	\$60	\$61	\$63	\$65	\$67	\$70	\$72	\$74	\$76	\$78	\$81	\$83	\$88
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [C]</i>														
[13]	FTE employment cost, base case (\$000s)	1.75x	\$101	\$104	\$108	\$111	\$115	\$118	\$122	\$125	\$129	\$133	\$137	\$141	\$146	\$150
[14]	Opioid % of medication take-backs	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%	66%
	<i>Total cost of disposal programs</i>	<i>2020-2034 [D]</i>														
[15]	Base case (\$000s)	\$3,733	\$207	\$208	\$214	\$221	\$227	\$233	\$240	\$247	\$254	\$261	\$269	\$276	\$284	\$301

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[2]: A GAO report (GAO-18-25, October 2017) found that only 3% of pharmacies and other entities eligible to collect unused Rx drugs for disposal have volunteered to do so.

[3]=[1]*(1+[2]).

[4]: King County, WA estimated the cost of drug disposal program was \$7,188 per site (2018\$). Other disposal programs have indicated the cost per site is in the range of \$1,300 to \$2,800 (2018\$).

[5]: [5A]=([3]*[4])/10^3. Year 1 onwards grown at projected inflation.

[6]: [6A]=([3]-[1])*\$850 (cost of steel drug disposal boxes sold by NADDI). Year 1 grown at projected inflation.

[7]: Assumes one event per week, excluding holidays.

[8]: Average event cost of \$2,000 + average drug disposal cost of \$250 per event.

[9]: [9B]=([7]*[8])/10^3. Year 1 onwards grown at projected inflation.

[11]=Table C.15[11].

[12]=([10]*[11])/10^3. Year 1 onwards grown at projected employment cost inflation.

[13]=[12]*[C].

[14]: Based on study finding that 66% of medications returned in take-back initiatives were opioids between 2011 and 2015. Jaramillo-Stametz, Stewart, Ochs et al. (2018).

[15]=[14]*([5]+[6]+[9]+[13]).

Table C.16

Estimated Cost of Law Enforcement Interventions, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
[1]	Law enforcement staffing requirements	2019\$ [A]														
[1]	Detectives investigating overdoses	25														
[2]	FTE salary estimate	\$63,000														
[3]	Salary cost (\$'000s)	\$1,575	\$1,631	\$1,689	\$1,745	\$1,802	\$1,858	\$1,915	\$1,974	\$2,034	\$2,096	\$2,160	\$2,226	\$2,293	\$2,363	\$2,436 \$2,510
[4]	County prosecutors	100														
[5]	Opioid-related % of charges	11.0%														
[6]	FTE salary estimate	\$55,500														
[7]	Salary cost (\$'000s)	\$608	\$630	\$652	\$674	\$696	\$718	\$740	\$762	\$785	\$809	\$834	\$860	\$886	\$913	\$941 \$969
	Labor Cost															
	Estimated employment cost	Multiplier [B]														
[8]	FTE employment cost, base case (\$'000s)	1.75x	\$3,956	\$4,096	\$4,233	\$4,371	\$4,508	\$4,646	\$4,788	\$4,934	\$5,084	\$5,239	\$5,399	\$5,564	\$5,733	\$5,908 \$6,089
	Total cost of recruitment	2020-2034 [C]														
[9]	Base case (\$'000s)	\$74,548	\$3,956	\$4,096	\$4,233	\$4,371	\$4,508	\$4,646	\$4,788	\$4,934	\$5,084	\$5,239	\$5,399	\$5,564	\$5,733	\$5,908 \$6,089

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

$$[C] = \Sigma(\text{Year 1 to Year 15}).$$

[1]: Officers working in heroin-involved death investigation (HIDI) unit (5 officers currently staffed + 20 additional officers required). See Deposition of Gary Gingell, November 20, 2018, pp. 243-244.

[2]: Based on 2019 budget salary range for Patrol Officer I position in Cleveland Division of Police.

[3]: [3A]=[1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]: Approximate # of attorneys employed in the Criminal Division of the Cuyahoga County Office of the Prosecutor.

[5]: 2017 opioid-related % of charges for Cuyahoga County Office of the Prosecutor, see Cutler Report, Table III.4[3].

[6]: Based on salary disclosed in job posting for Assistant Prosecuting Attorney position in Cuyahoga County Office of the Prosecutor in February 2019.

[7]: [7A]=[4]*[5]*[6])/10^3. Year 1 onwards grown at projected employment cost inflation.

$$[8] = ([3] + [7]) * [B].$$
$$[9]=[8].$$

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Table S.16

Estimated Cost of Law Enforcement Interventions, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Law enforcement staffing requirements</i>	<i>2019\$ [A]</i>														
[1]	Detectives investigating overdoses	4														
[2]	FTE salary estimate	\$59,000														
[3]	Salary cost (\$000s)	\$236	\$244	\$253	\$261	\$270	\$278	\$287	\$296	\$305	\$314	\$324	\$333	\$344	\$354	\$376
[4]	County prosecutors	29														
[5]	Opioid-related % of crimes	11.8%														
[6]	FTE salary estimate	\$56,000														
[7]	Salary cost (\$000s)	\$192	\$199	\$206	\$213	\$220	\$226	\$233	\$241	\$248	\$255	\$263	\$271	\$280	\$288	\$306
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>														
[8]	FTE employment cost, base case (\$000s)	1.75x	\$775	\$803	\$830	\$857	\$884	\$911	\$938	\$967	\$997	\$1,027	\$1,058	\$1,091	\$1,124	\$1,158
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>														
[9]	Base case (\$000s)	\$14,612	\$775	\$803	\$830	\$857	\$884	\$911	\$938	\$967	\$997	\$1,027	\$1,058	\$1,091	\$1,124	\$1,193

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Officers working on heroin-involved death investigations (2 officers currently staff plus 2 additional officers required). See AKRON_001121745.

[2]: Based on salary range disclosed in job posting for Police Officer position in Akron Police Division in February 2019.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]: Approximate # of prosecutors employed in the Criminal Division of the Summit County Prosecutor. Summit County 2019 Operating Budget at p. 282.

[5]: 2017 opioid-related % of crimes for Summit County Office of the Prosecutor, see Cutler Report, Table III.4[9].

[6]: Based on salary range disclosed in job posting for Assistant Prosecutor position in Summit County Prosecutor.

[7]: [7A]=([4]*[5]*[6])/10^3. Year 1 onwards grown at projected employment cost inflation.

[8]=([3]+[7])*[B].

[9]=[8].

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Table C.17

Estimated Cost of Tracking Abatement Progress, Cuyahoga County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Increase medical examiner staffing</i>	<i>2019\$ [A]</i>															
[1]	Forensic scientist FTEs	3															
[2]	FTE salary estimate	<u>\$50,000</u>															
[3]	Salary cost (\$000s)	<u>\$150</u>	\$155	\$161	\$166	\$172	\$177	\$182	\$188	\$194	\$200	\$206	\$212	\$218	\$225	\$232	\$239
[4]	Autopsy technician FTEs	1															
[5]	FTE salary estimate	<u>\$45,000</u>															
[6]	Salary cost (\$000s)	<u>\$45</u>	\$47	\$48	\$50	\$51	\$53	\$55	\$56	\$58	\$60	\$62	\$64	\$66	\$68	\$70	\$72
		<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>															
[7]	FTE employment cost, base case (\$000s)	1.75x	\$353	\$366	\$378	\$390	\$403	\$415	\$428	\$441	\$454	\$468	\$482	\$497	\$512	\$528	\$544
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>															
[8]	Base case (\$000s)	\$6,658	\$353	\$366	\$378	\$390	\$403	\$415	\$428	\$441	\$454	\$468	\$482	\$497	\$512	\$528	\$544

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]-[2], [4]-[5]: Based on 2018 personnel cost commitments for heroin/fentanyl crisis as reported by Cuyahoga County Medical Examiner's Office. CUYAH_001633454-55.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[6]: [6A]=([4]*[5])/10^3. Year 1 onwards grown at projected employment cost inflation.

[7]=([3]+[6])*[B].

[8]=[7].

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Table S.17

Estimated Cost of Tracking Abatement Progress, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Increase medical examiner staffing</i>	<i>2019\$ [A]</i>														
[1]	Forensic scientist FTEs	1														
[2]	FTE salary estimate	\$50,000														
[3]	Salary cost (\$000s)	\$50	\$52	\$54	\$55	\$57	\$59	\$61	\$63	\$65	\$67	\$69	\$71	\$73	\$75	\$80
[4]	Autopsy technician FTEs	1														
[5]	FTE salary estimate	\$45,000														
[6]	Salary cost (\$000s)	\$45	\$47	\$48	\$50	\$51	\$53	\$55	\$56	\$58	\$60	\$62	\$64	\$66	\$68	\$72
	<i>Estimated employment cost</i>	<i>Labor Cost Multiplier [B]</i>														
[7]	FTE employment cost, base case (\$000s)	1.75x	\$172	\$178	\$184	\$190	\$196	\$202	\$208	\$215	\$221	\$228	\$235	\$242	\$249	\$257
	<i>Total cost of recruitment</i>	<i>2020-2034 [D]</i>														
[8]	Base case (\$000s)	\$3,244	\$172	\$178	\$184	\$190	\$196	\$202	\$208	\$215	\$221	\$228	\$235	\$242	\$249	\$257

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2]=Table C.17[2].

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[5]=Table C.17[5].

[6]: [6A]=([4]*[5])/10^3. Year 1 onwards grown at projected employment cost inflation.

[7]=([3]+[6A])*[B].

[8]=[7].

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Table C.18

Estimated Cost of Court System Resources, Cuyahoga County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Staff court systems</i>	<i>2019\$ [A]</i>															
[1]	FTEs required for system coordination	2															
[2]	FTE salary estimate	<u>\$73,500</u>															
[3]	Salary cost (\$000s)	<u>\$147</u>	\$152	\$158	\$163	\$168	\$173	\$179	\$184	\$190	\$196	\$202	\$208	\$214	\$221	\$227	\$234
		<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>															
[4]	FTE employment cost, base case (\$000s)	1.75x	\$266	\$276	\$285	\$294	\$304	\$313	\$322	\$332	\$342	\$353	\$364	\$375	\$386	\$398	\$410
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$5,019	\$266	\$276	\$285	\$294	\$304	\$313	\$322	\$332	\$342	\$353	\$364	\$375	\$386	\$398	\$410

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Assumes 1 FTE staffed at Cuyahoga County Common Pleas Court and 1 FTE staffed at Cleveland Municipal Court.

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table S.18

Estimated Cost of Court System Resources, Summit County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>Staff court systems</i>	<i>2019\$ [A]</i>															
[1]	FTEs required for system coordination	2															
[2]	FTE salary estimate	<u>\$73,500</u>															
[3]	Salary cost (\$000s)	<u>\$147</u>	\$152	\$158	\$163	\$168	\$173	\$179	\$184	\$190	\$196	\$202	\$208	\$214	\$221	\$227	\$234
		<i>Labor Cost</i>															
	<i>Estimated employment cost</i>	<i>Multiplier [B]</i>															
[4]	FTE employment cost, base case (\$000s)	1.75x	\$266	\$276	\$285	\$294	\$304	\$313	\$322	\$332	\$342	\$353	\$364	\$375	\$386	\$398	\$410
	<i>Total cost of recruitment</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$5,019	\$266	\$276	\$285	\$294	\$304	\$313	\$322	\$332	\$342	\$353	\$364	\$375	\$386	\$398	\$410

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[1]: Assumes 1 FTE staffed at Summit County Court of Common Pleas and 1 FTE staffed at Akron Municipal Court.

[2]=Table C.18[2].

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

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Table S.19

Estimated Cost of Data-Informed Systems Re-Engineering & Management, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
	<i>Team employment costs</i>															
	<i>2019\$ [A]</i>															
[1]	Executive director	1														
[2]	FTE salary estimate	\$122,400														
[3]	Salary cost (\$000s)	\$122	\$127	\$131	\$136	\$140	\$144	\$149	\$153	\$158	\$163	\$168	\$173	\$178	\$184	\$189
[4]	Program managers	2														
[5]	FTE salary estimate	\$76,000														
[6]	Salary cost (\$000s)	\$152	\$157	\$163	\$168	\$174	\$179	\$185	\$190	\$196	\$202	\$208	\$215	\$221	\$228	\$235
[7]	Data analyst	1														
[8]	FTE salary estimate	\$75,000														
[9]	Salary cost (\$000s)	\$75	\$78	\$80	\$83	\$86	\$88	\$91	\$94	\$97	\$100	\$103	\$106	\$109	\$113	\$116
[10]	Staff assistant	1														
[11]	FTE salary estimate	\$57,132														
[12]	Salary cost (\$000s)	\$57	\$59	\$61	\$63	\$65	\$67	\$69	\$72	\$74	\$76	\$78	\$81	\$83	\$86	\$88
	<i>Labor Cost</i>															
	<i>Estimated employment cost</i>															
	<i>Multiplier [B]</i>															
[13]	Employment cost, base case (\$000s)	1.75x	\$737	\$763	\$788	\$814	\$839	\$865	\$891	\$919	\$947	\$976	\$1,005	\$1,036	\$1,068	\$1,100
	<i>Total cost of team</i>															
	<i>2020-2034 [C]</i>															
[14]	Base case (\$000s)	\$13,881	\$737	\$763	\$788	\$814	\$839	\$865	\$891	\$919	\$947	\$976	\$1,005	\$1,036	\$1,068	\$1,100

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2], [5], [8] and [11] based on Government Performance Lab (GPL) budget salaries.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[6]: [6A]=([4]*[5])/10^3. Year 1 onwards grown at projected employment cost inflation.

[9]: [9A]=([7]*[8])/10^3. Year 1 onwards grown at projected employment cost inflation.

[12]: [12A]=([10]*[11])/10^3. Year 1 onwards grown at projected employment cost inflation.

[13]=([3]+[6]+[9]+[12])*[B].

[14]=[13].

GOVERNMENT PERFORMANCE LAB PROJECTS¹

BEHAVIORAL HEALTH & HOMELESSNESS PROJECTS

- Bernalillo County Behavioral Health Services
- Denver Permanent Supportive Housing Pay for Success
- Los Angeles Homeless Services Authority Performance Improvement
- Massachusetts Permanent Supportive Housing Pay for Success
- Seattle, WA Homeless Service Contracts
- Boston, MA Department of Neighborhood Development Rapid Rehousing Performance Improvement
- Boulder, CO Homeless Shelter Contracts
- Chicago, IL Homelessness Services Performance Improvement
- Connecticut Family Stability Pay for Success
- Florida Child Welfare Behavioral Health Treatment
- Illinois Developmental Disabilities Performance Improvement
- Las Vegas, NV Homeless Services Pilot
- Louisville, KY Metro Department of Corrections Pay for Success Feasibility
- Massachusetts Shelter Contract Performance Improvement
- Napa County Performance Improvement Initiatives
- New Mexico Supportive Housing Pay for Success Feasibility
- New York Supportive Housing Olmstead Cohort
- Olmstead Supportive Housing Cohort
- Placer County, CA Homelessness and Behavioral Health Performance Improvement
- Rhode Island Division of Developmental Disabilities Active Contract Management
- Rhode Island Permanent Supportive Housing Pay for Success
- Salt Lake County Homelessness Collective Impact
- Sonoma County, CA Housing Instability and Behavioral Health Collective Impact
- Washington Supportive Housing Olmstead Cohort

CHILDREN & FAMILIES PROJECTS

- Connecticut Department of Children and Families Enhanced Service Coordination
- Illinois Wraparound Services for Child Welfare and Juvenile Justice-Involved Youth
- Michigan Strong Beginnings Pay for Success
- New Haven, CT Youth Violence Prevention
- Rhode Island Department of Children, Youth, and Families Performance Improvement
- South Carolina Nurse Family Partnership Pay for Success
- Arizona Child Welfare Performance Improvement
- Chicago, IL Coordinated Case Management for High-Needs Families
- Illinois Child Welfare Pay for Success Feasibility
- Nevada Pre-K Pay for Success Feasibility
- New Hampshire Child Welfare Intake and Foster Care

¹ <https://govlab.hks.harvard.edu/projects>

- New York City Children’s Cabinet Performance Improvement
- Rhode Island Department of Health Family Home Visiting Performance Improvement
- Rhode Island Department of Health Pay for Success Feasibility
- Riverside County Active Contract Management for Family Preservation
- Seattle Criminal Justice-Involved Youth Services
- Vermont Agency of Human Services Pay for Success Feasibility
- Washington Department of Children, Youth, and Families Prevention Services Integration

CRIMINAL JUSTICE PROJECTS

- Alameda County Recidivism Reduction Through Life Coaching and Mentoring Services
- Arkansas Recidivism Reduction Pay for Success Project
- Baltimore, MD Police Department IT Procurement
- California Criminal Justice Pay for Success Grant Competition
- Illinois Corrections Internal Programming Restructuring Performance Improvement
- Illinois Department of Juvenile Justice Performance Improvement
- Illinois Vocational Programs for Corrections Performance Improvement
- Massachusetts Juvenile Justice Recidivism Reduction Pay for Success
- New York State Criminal Justice Re-Entry Services
- Pennsylvania Criminal Justice Pay for Success
- Rhode Island Department of Corrections Discharge Planning Performance Improvement

EDUCATION & JOBS PROJECTS

- California Department of Social Services SNAP Job Training and Employment Services
- Massachusetts Pathways to Economic Advancement Pay for Success
- Rhode Island Workforce Development
- San Francisco, CA Workforce Development Contract Alignment
- Washington, DC Workforce Development Agency Coordination
- Chicago Pay for Success Pre-K Expansion
- Chicago, IL Workforce Services Performance Improvement
- Cuyahoga County TANF and SNAP Workforce Development
- Glendale, AZ After School Education Services
- Illinois Career Outcomes for Higher Education
- Massachusetts Veterans Coordinated Approach to Recovery and Employment Pay for Success
- Memphis, TN Shelby County School District Student Support Services
- North Carolina Performance Improvement in Workforce Development
- Providence, RI Workforce Development Services
- Rhode Island Adult Basic Education Performance Improvement
- Rhode Island TANF Work Supports
- San Francisco, CA Performance Based Payments Pilot
- San Francisco, CA Workforce Development and Mobility Mentoring
- Washington, DC One Stop Contracts

PROCUREMENT SYSTEMS PROJECTS

- Boston, MA Asphalt Resurfacing
- Boston, MA Capital Project IT System
- Boston, MA Procurement for Bike Share Operator
- Boston, MA Vendor Diversity
- Charleston, SC Waste Collection Services
- Indianapolis, IN Technology Service Contracts
- Little Rock, AR Vendor Report Cards
- Louisville, KY Strategic Procurement System
- Mesa, AZ Blight Remediation
- Saint Paul, MN Street Construction
- Tempe, AZ City Employee Wellness
- Wichita, KS Ground Maintenance Contracts
- Baltimore, MD Pay for Success Feasibility
- Boston, MA Capital Projects Prioritization Framework
- Boston, MA Smart Street Lights
- Cambridge, MA Constituent Relationship Management System
- Charleston, SC Affordable Housing Development
- Chicago Department of Family and Support Services Strategic Procurement
- Corona, CA Asphalt Resurfacing Services
- Corona, CA Vendor Evaluation
- Glendale, AZ Open Contracting Pilot
- Houston, TX Pay for Success Feasibility
- Kansas City, KS Vendor Report Cards
- Little Rock, AR Procurement Reform
- Los Angeles Strategic Procurement System
- Louisville, KY Vendor Report Cards
- Massachusetts Strategic Operations
- Minneapolis, MN Professional Services Contracts
- Naperville, IL Technology Contracts
- Oklahoma City, OK Street Construction Projects
- Portland, OR Street Construction
- Providence, RI Vendor Report Cards
- Rhode Island Division of Purchases Performance Improvement
- San Francisco, CA Human Services Procurement Reform
- Santa Cruz Homelessness Services Performance Improvement
- Santiago, Chile Strategic Procurement System
- Seattle Performance Management System
- Sioux Falls Public Works Professional Services Procurement
- Vendor Report Cards Cities Cohort

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EXPERT REPORT OF DR. JEFFREY B. LIEBMAN

March 25, 2019

I. EXECUTIVE SUMMARY

1. The communities of Cuyahoga County and Summit County, Ohio (the “Communities”) are in the midst of a public health emergency due to the growth in the use of prescription opioids and the harms resulting from such use.¹ Thousands of residents have died; hundreds of infants have suffered the ill effects of neonatal abstinence syndrome; families have been separated due to the struggles with addiction; and neighborhoods have declined.² The need to respond to opioid-related social harms have diverted public sector resources from other valuable purposes while still leaving many harms unaddressed.³

2. I have been asked to present opinions related to (i) identifying how the Communities can best utilize the tools and practices available to implement programs aimed at furthering the communities’ efforts to ameliorate and abate the crisis they face; and (ii) estimating the cost of providing these services.

3. Making rapid and deep progress in these two communities will require both a substantial increase in resources and effective coordination of those resources. As set forth in the Expert Report of Dr. Caleb Alexander, a community opioid abatement plan has many components, including initiatives to reduce opioid oversupply and encourage safe opioid use; and to identify and treat individuals with Opioid Use Disorder (OUD). Here I propose an Abatement Plan for the Cuyahoga and Summit communities, which includes measures to achieve the goals discussed by Dr. Alexander. The components of the Abatement Plan outlined below can be summarized in the following four categories: Treatment; Harm Reduction; Primary Prevention; and System Coordination.

- **Treatment** includes additional capacity for detoxification, inpatient and outpatient therapy, recovery housing, and medication-assisted treatment (or MAT), resources for

¹ See T. Gilson Deposition Tr. 176:14-178:12; A. Vince Deposition Tr. 186:6-187:7.

² I understand that the Expert Report of Jonathan Gruber documents the growth in opioid shipments in the last two decades, the relationship between this growth and opioid-related mortality, and how the initial growth from the mid 1990’s to 2010 precipitated the rapid growth in illicit opioid mortality in recent years. I further understand that the Expert Report of David Cutler further documents the impact of defendants’ misconduct on social harms including mortality, crime, and the demand for foster care services.

³ I understand that the Expert Report of Thomas McGuire on damages estimates the costs faced by Bellwether governments due to the opioid crisis.

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better connecting individuals to treatment services, and targeted interventions with high priority populations – those in jail, families in the child welfare system, and opioid-using pregnant women and new mothers.

- **Harm reduction** includes distributing naloxone, resources for needle exchange, and interventions to treat and reduce the spread of HIV and hepatitis C among intravenous drug users, as well as the provision of housing support for vulnerable populations that have high rates of opioid use.
- **Primary prevention** includes media campaigns to reduce opioid use and misuse and decrease the stigma of seeking treatment, school-based prevention programs, resources for law enforcement, drug disposal programs, and medical provider education.
- **System coordination** involves data collection and surveillance to track the evolution of the epidemic in the communities so that resources can be efficiently deployed to their most effective use, staffing to coordinate the overall effort so that the different pieces of the plan work effectively together, and resources for law enforcement so that individuals can be more effectively connected to services and appropriate supervision.

4. The types of programs and services that fall into each of these categories, as well as recommended elements of such programs and services, are described in further detail in the Expert Reports of Dr. Alexander, Dr. Theodore Parran, and Dr. Anna Lembke. As noted by Dr. Alexander, while there are many elements of an opioid-related abatement program, there is not a one-size fits-all approach to abating the problem in all communities. As set forth in my opinions below, this report focuses on and sets forth the scope of the programs and services recommended in the Abatement Plan for the Cuyahoga and Summit communities and ultimately the costs of efforts required to abate the opioid crisis in these communities.

II. QUALIFICATIONS

5. I am the Malcolm Wiener Professor of Public Policy at the Harvard Kennedy School, where I direct the Taubman Center for State and Local Government as well as the Government Performance Lab (GPL).

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6. I received a Ph.D. in Economics from Harvard University in 1996. I have published numerous peer-reviewed journal articles, essays, and book chapters. I teach courses on the Economic Analysis of Public Policy, American Economic Policy, and Government Turnarounds. I specialize in Public Finance and Health Economics as well as state and local government policies. My research focuses on tax, budget, and health policy, impact evaluations of social programs, and strategies for making government social service agencies more effective. My CV is included as Appendix A.

7. I have twice served in government. From 1998-1999, I was Special Assistant to the President for Economic Policy and coordinated the National Economic Council's Social Security reform technical working group. From 2009 to 2010, I worked at the Office of Management and Budget, first as Executive Associate Director and Chief Economist and then as Acting Deputy Director. In both periods of government service, I supervised the development of cost estimates of complicated multi-faceted government initiatives, including Social Security reform, the American Recovery and Reinvestment Act of 2009, and the Affordable Care Act of 2010.⁴

8. The Government Performance Lab (GPL) at the Harvard Kennedy School, which I founded in 2011 and direct, provides pro bono technical assistance to state and local government agencies, mostly social service agencies, to help them improve the results they achieve for their residents. We help agencies undertake performance improvement projects by embedding recent graduates of public policy, law, and business schools in government agencies, typically for 18-24 months.

9. To date, GPL has undertaken close to 100 projects in more than 30 states. These projects include providing assistance in the areas of behavioral health and homelessness,

⁴ American Recovery and Reinvestment Act of 2009: Law, Explanation and Analysis: P.L. 111-5, as Signed by the President on February 17, 2009. Chicago, Ill.: CCH, 2009; United States. Compilation Of Patient Protection and Affordable Care Act: as Amended through November 1, 2010 Including Patient Protection and Affordable Care Act Health-Related Portions of the Health Care and Education Reconciliation Act of 2010. Washington: U.S. Government Printing Office, 2010.

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criminal justice, education and jobs, and children and families. We currently have 40 employees, nearly all embedded in state, city, and county agencies around the country.⁵

10. A significant share of GPL's work has involved substance use issues. For example, we worked with the states of Connecticut and Florida to develop systems to better connect parents in their child welfare systems with substance use treatment. We have worked with Denver, Colorado and the Commonwealth of Massachusetts on identifying chronically homeless individuals with complicated mental health and substance use challenges and prioritizing them for supportive housing. We worked with the Louisville, Kentucky Metro Jail on an initiative to connect releasees to substance use treatment. We worked with Bernalillo County, New Mexico (Albuquerque), on how to most effectively spend the resources from a new behavioral health levy to combat addiction and other behavioral health challenges.⁶

11. I am being compensated on an hourly basis for my work on this matter at a rate of \$900 per hour and \$1,000 per hour for any deposition or trial testimony I am required to provide. I am also being reimbursed for my out-of-pocket expenses. My compensation does not depend on the outcome of the case or the substance of my opinions.

12. The opinions and conclusions in this report are based on information and documentation available to me at this time, and I reserve the right to supplement and revise the opinions and conclusions expressed in this report based on additional evidence or information provided to me after the date of this report. The materials I considered in preparing my analysis and forming my conclusions are attached as Appendix B.

III. SUMMARY OF OPINIONS

13. In this report I present the following opinions and describe the evidence and analysis related thereto:

14. I conclude that there is a framework within the area of applied economics by which an economist can reasonably evaluate (a) the level of abatement resources needed for the next 15 years in the communities of Cuyahoga County and Summit County, Ohio, to abate the

⁵ A full list of the projects I have overseen by jurisdiction is set forth at <https://govlab.hks.harvard.edu/projects>.

⁶ Id.

opioid crisis and (b) the cost of those resources. In particular, an economist can use data regarding the target populations and their service needs as well as community input and the opinions of other medical and epidemiological experts to develop the scope of programming needed in order to address the opioid crisis in these communities. As discussed further below, the economist can utilize standard and widely accepted tools of empirical economic analysis and public sector budgeting, as informed by professional experience and judgment, to estimate the costs of providing this programming.

15. My analysis estimates the cost of abatement programming required from 2020-34 to abate the harms in the two communities resulting from the opioid crisis. The economic literature on public health recognizes that it is not realistic to assume that health policies will help all affected individuals -- even the best designed policies will not be successful in reaching every member of a target population, and some addicted individuals will choose not to receive treatment when available.

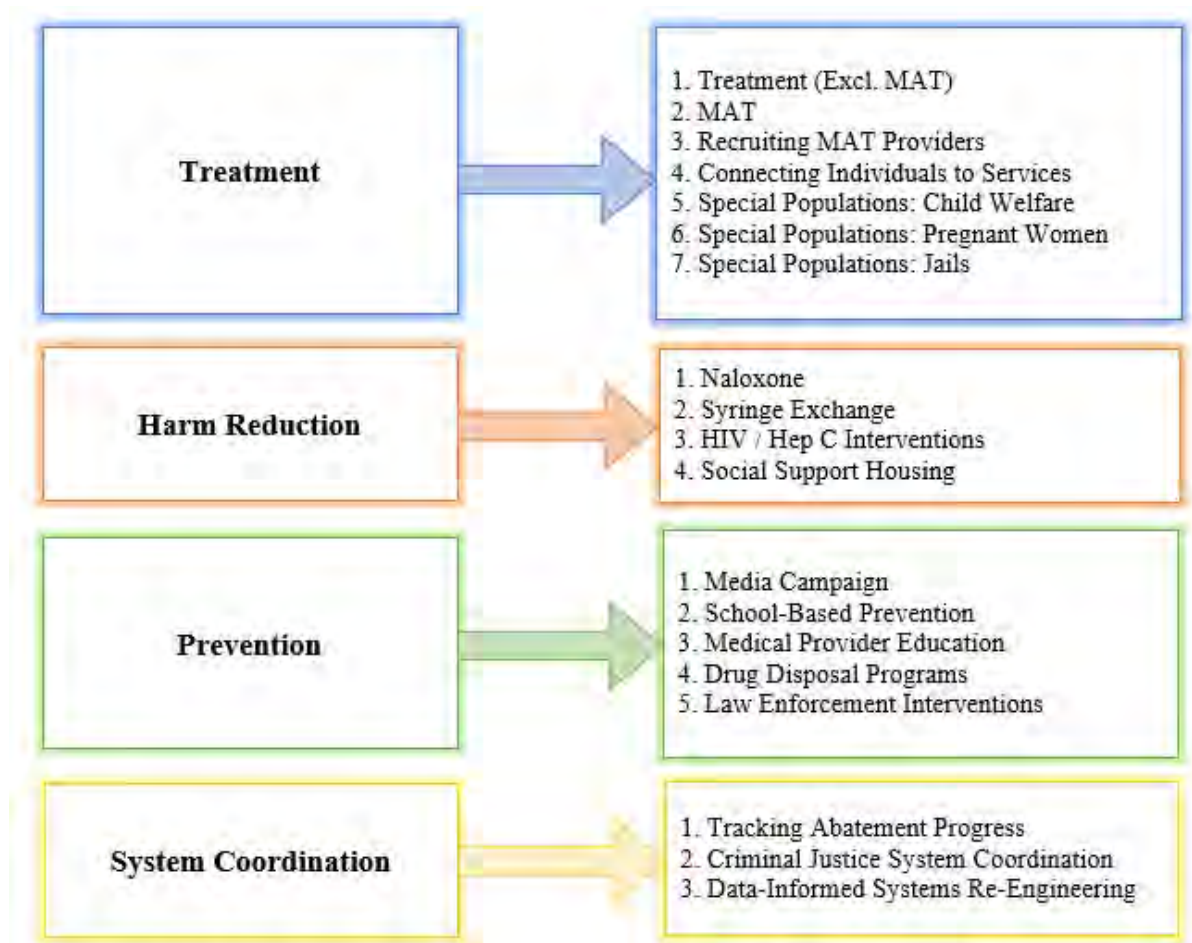
16. Instead, the analysis attempts to estimate the costs to implement a policy based on a feasible and realistic view of what can be achieved. Estimates of the cost of treatment -- the largest component of cost under the Abatement Plan -- are based on the view that, even with intensive expansion of resources, the number of individuals with opioid use disorder (OUD) who receive treatment (currently about 20 percent of the OUD population) will double to 40 percent, and the number of individuals who currently receive Medication Assisted Treatment, roughly seven percent of the OUD population, will quadruple to 27 percent. These projections are discussed further below.⁷

17. As discussed further below, the Abatement Plan identifies four major area of needed services: treatment programs, harm reduction programs, prevention programs, and system coordination efforts. Several specific programs are identified in each category (see Figure 1). This report presents costs estimates for seven major programs which are expected to account for a large portion of the program costs. I intend to supplement this report with cost estimates for the remaining programs after reviewing information recently provided in discovery

⁷ My estimates of plan costs are not reduced to reflect costs arising in connection with heroin use in the community where the individual had never used prescription opioids.

and related information. My analysis does not address how abatement costs should be shared among various entities or parties.

Figure 1
Elements for the Community Abatement Strategy
Cuyahoga and Summit Counties



18. Based on my study of the abatement needs of the Cuyahoga and Summit communities and application of the methodologies and analysis described in this report, I estimate that implementation of the seven major programs of Abatement Plan evaluated to date will cost \$4.0 billion in Cuyahoga County and \$1.7 billion in Summit County over the next 15 years. These totals reflect estimates of the largest categories of costs currently faced by the Cuyahoga and Summit Communities in abating the opioid crisis as well as estimates of additional costs needed to make greater progress in abating opioid disorders. In addition, I am

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informed that the costs of certain services contemplated in the Plan have been or will be provided in documents or testimony from the Counties. To the extent that the costs of additional elements of the Plan are required, I am prepared to supplement this Report. Estimates of the annual elements of the costs of each of these programs for which costs have been estimated and the sources of the data used in developing these estimates are reported in an appendix to this report.⁸ I understand other expert reports also discuss the effectiveness of these interventions at reducing mortality and morbidity associated with opioid addiction.⁹

19. Available studies indicate that an intensive effort like the one described in this plan is needed to address the problems faced in these communities because of the opioid epidemic and further indicate that implementation of such a range of programs will result in reduced mortality and morbidity associated with opioid addiction.¹⁰

20. Because it is possible that the epidemic will evolve in ways that either reduce or increase the need for resources relative to my primary estimates, it is appropriate for me as an economist to provide a range of estimates for lower cost and higher cost scenarios.¹¹ It is also important to build in feedback mechanisms into the Abatement Plan, so that the level of abatement resources and the allocation of those resources can be adjusted over time as new information about needs becomes available.

⁸ The Abatement Plan provides estimates for certain of the largest resource needs in these communities. In particular, and as set forth in Tables 1 and 2 below, costs are estimated for the following categories: treatment, MAT, recruiting providers to administer MAT, naloxone, the syringe exchange program, a mass media campaign, and school-based prevention. In addition, I am informed that the costs of certain services contemplated in the Plan have been or will be provided in documents or testimony from the Counties. To the extent that the costs of additional elements of the Plan are required, I am prepared to supplement this Report.

⁹ I understand that these are discussed in the Expert Reports of Anna Lembke, Caleb Alexander, and Katherine Keyes.

¹⁰ Pitt, Allison L., Keith Humphreys and Margaret L. Brandeau. "Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic." *AJPH Open Themed Research* Vol. 108 no. 10 (Oct 2018): 1394-1400. Pitt, et al. conclude that "[p]olicies that focus on services for currently addicted people provide health benefits immediately without causing harm. However, no epidemic has ever been averted solely by treating single affected cases. Instead, portfolios of policies will likely be required, including those that prevent addiction, treat addiction, and mitigate its effects." (at 1399).

¹¹ As an example, see the range of projections of future opioid deaths presented in M. Blau, "STAT forecast: Opioids could kill nearly 500,000 Americans in the next decade," <https://www.statnews.com/2017/06/27/opioid-deaths-forecast> (June 27, 2017).

21. The rationale and justification for these opinions are set forth in more detail in the remainder of this report.

IV. BACKGROUND ON THE OPIOID EPIDEMIC IN CUYAHOGA AND SUMMIT COUNTY AND UNMET NEEDS

22. The nationwide opioid epidemic is hitting the Cuyahoga and Summit communities particularly hard. The Cuyahoga County Opiate Task Force has estimated that as of 2016, 73,200 Cuyahoga residents misuse or abuse prescription opioids each year in the county and that 20,562 of them make the switch to heroin each year.¹² Opioid-related overdose deaths in Cuyahoga County increased from 93 in 2005; to 191 in 2012; to 524 in 2017 as the use of Fentanyl spread.¹³ In Summit County, the number of opioid-related overdose deaths rose from less than 20 in 2005 to 60 in 2012 to 190 in 2017.¹⁴ I understand that the Expert Report of Jonathan Gruber documents that the per capita overdose death rate in Cuyahoga County is among the highest county-level rates in the nation. And these mortality rates understate the true magnitude of opioid-related health risks since many additional individuals overdosed but were saved by application of opioid antagonists such as naloxone by first responders. The Cuyahoga medical examiner reports that nearly 900 people were saved in Cuyahoga county through project DAWN (Deaths Avoided with Naloxone) in 2017.¹⁵

23. Hundreds of children are being adversely affected by the opioid crisis in both communities. Between 2013 and 2017, Summit County reported 426 hospitalizations due to neonatal abstinence syndrome (NAS) and Cuyahoga County reported 629.¹⁶ In 2017 alone, Summit County reported 79 hospitalizations due to NAS in 2017; Cuyahoga County reported 137 NAS hospitalizations.

24. As discussed further below, obtaining information about local conditions and service gaps from local experts is a key element in the design of government policy and is a

¹² Cuyahoga County Opiate Task Force Report, 2016.

¹³ Source: Multiple Causes of Death Data, accesses on CDC Wonder.

¹⁴ Source: Multiple Causes of Death Data, accesses on CDC Wonder.

¹⁵ Cuyahoga County Medical Examiner's Office, Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County, http://medicalexaminer.cuyahogacounty.us/pdf_medicalexaminer/en-US/HeroinFentanylReports/090718-HeroinFentanylCocaine-ME-report-Aug.pdf (Sep. 17, 2018), p. 5.

¹⁶ Source: https://odh.ohio.gov/wps/wcm/connect/gov/4cad708c-ba99-4b8b-b425-01cfef119c5d/2017+NAS+County+Table+12.3.2018.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-4cad708c-ba99-4b8b-b425-01cfef119c5d-muueFzr

standard element in the framework used in GPL projects. In the initial phase of this project, I had extensive conversations about opioid-related issues with local government officials, law enforcement officials, medical practitioners, and social service providers. A list of individuals interviewed in the process is attached as Appendix C. Each of these individuals stressed that needs for opioid-related services often go unmet due to the limitations of available resource and related obstacles to providing opioid-related services. This section briefly summarizes some observations based on these conversations, information provided in response to these conversations, and transcripts of depositions of community members. My abatement plan takes into account the information I learned in these interviews.

25. My discussions with local law enforcement officials indicated that EMS, police, and fire department resources are being diverted from other activities in order to respond to opioid overdoses. The Cleveland Police Department reports that officers who previously were assigned to disrupting the operations of drug dealers now spend all of their time investigating overdose deaths.¹⁷

26. While additional treatment resources have been added, there is neither enough treatment capacity nor sufficient coordination to connect individuals who need treatment for opioid addiction to get services. In addition, in Summit County, the director of the ADM Board reports that only about 20 percent of individuals with overdose deaths had previously received services and that their working assumption is that only 10 percent of the people needing help get it.¹⁸ The Summit Opioid Task Force reports wait times of 26 days for residential treatment.¹⁹ However, local experts also note that people can only be put on wait lists for services after they have had their need assessed, and if there were a sufficient number of assessors, the waiting lists for treatment would appear much greater.²⁰ Lack of 24-7 access to treatment misses the often-narrow window of opportunity when a person may be open to entering treatment, for example after an overdose.

¹⁷ Deposition of Gary Gingell, November 20, 2018, pp. 237, 175-176.

¹⁸ Call with G. Craig of Summit County Alcohol, Drug Addiction & Mental Health Services Board, July 3, 2018.

¹⁹ Summit County Opiate Task Force, Key Stakeholders Annual Meeting, Meeting Notes 6/25/2018 (SUMMIT_001164135), at p. 2.

²⁰ Comment by D. Skoda at Round-table Meeting with Representatives of the Summit County Community, July 11, 2018.

27. Based on this review and my experience as an economist and policy analyst, significant needs in the Cuyahoga and Summit Communities are currently going unmet and significant additional resources are required in order to meet the demand for opioid-related services.

V. FRAMEWORK AND METHODOLOGY

28. As noted above, the development of the Abatement Plan for the Cuyahoga and Summit Communities and estimation of the funding needed for this plan applies the general methodological framework used in my prior analysis of government programs, in my academic and government work, as well as in the nearly 100 projects that have been implemented under my direction at the GPL. My framework follows the standard approaches used by the Congressional Budget Office²¹, the President's Office of Management and Budget²² and the Government Accountability Office²³ in estimating costs and projecting budgets.

29. To estimate the cost of implementing the Abatement Plan, I first gathered qualitative information about the need for opioid-related services in the Cuyahoga and Summit communities, including assessments of the populations in need of services, existing infrastructure and service gaps, and information on the contours and severity of the epidemic. This initial information gathering phase of my analysis involved meetings and phone calls with community members involved in addressing the opioid crisis, including medical service providers, social service providers and individuals in government. Information gained in this review helped to identify the services needed in the Cuyahoga and Summit communities, the extent to which services can be expanded, the length of the "ramp up" period, and the length of time for which services are likely to be needed.

²¹ Congressional Budget Office, "How CBO Prepares Cost Estimates," (February 2018) (<https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53519-costestimates.pdf>)

²² Executive Office of the President, Office of Management and Budget, "Circular No. A-11, Preparation, Submission and Execution of the Budget," (June 2018).

²³ Government Accountability Office, "GAO Cost Estimating and Assessment Guide," (March 2009) (<https://www.gao.gov/new.items/d093sp.pdf>)

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30. Second, I have collected data measuring the extent of the opioid crisis and current response efforts in the Cuyahoga and Summit communities. This has included the review of public data on the extent of OUD; analyses on the quality and reliability of available OUD data; and information on OUD treatment programs in these communities. This analysis has also included efforts to estimate the costs of opioid treatment, harm reduction, prevention, and system coordination.

31. Finally, I have reviewed the published literature on remedies to the opioid epidemic, on the effectiveness of proposed interventions, and on the experience of other communities that have adopted similar interventions.²⁴

32. As noted, the approach of identifying the target population, assessing population needs, selecting the set of programs that can best meet these needs, and then estimating the costs of providing the programming is widely applied in public economics and policy analysis. Evaluating community needs based on quantitative data and then verifying the estimates based on information obtained from local experts is also standard practice. Analysis of related topics such as program design and implementation, budgeting, and forecasting are central to the curriculum at the Harvard University's Kennedy School of Government where I teach courses in the "Economic Analysis of Public Policy" and "Government Turnarounds" which directly relate to these topics. As GPL's name suggests, setting performance-based goals for projects and implementing on-going monitoring and continuous improvement efforts to enable projects to meet their goals is a significant part of the Lab's work and has been a primary emphasis of the projects that I direct there. Policy design and evaluation also requires the exercise of

²⁴ Examples of the literature reviewed include: Centers for Disease Control and Prevention, *Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States*. 2018. Brooklyn, Johan and Stacey C. Sigmon, "Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact," *Journal of Addiction Medicine* 2017, 11(4): 286-292. Hernandez, Yamilette et al., "How Massachusetts, Vermont, and New York are Taking Action to Address the Opioid Epidemic," *American Journal of Public Health*, 2018, 108:12, 1621-1622. U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, *Facing Addiction in America: The Surgeon General's Spotlight on Opioids*. Washington, DC: HHS, September 2018. National Academies of Sciences, Engineering, and Medicine. 2017. *Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use*. Washington, DC: The National Academies Press.

professional judgement, which I have developed over the past 22 years in undertaking related types of analyses.

VI. OVERVIEW OF ABATEMENT PLAN

A. Origins of the Abatement Plan

33. Communities around the U.S. that are showing incipient progress in reducing opioid use and opioid deaths have followed a common set of strategies. They have increased the availability of treatment, including MAT. They have reduced obstacles that prevent individuals from obtaining access to the available treatment. They have invested in harm reduction, increasing access to naloxone and fentanyl test strips to prevent deaths among those still misusing opiates and taking steps to minimize the spread of HIV and Hepatitis C among heroin users. They have invested in primary prevention to reduce the number of individuals that newly develop Opioid Use Disorder. They have put resources into system coordination so that new developments are tracked and quickly responded to, resources are allocated effectively, and the rate of individuals falling through the cracks because of failed handoffs is minimized.

34. The Abatement Plan outlined and evaluated in this report builds on approaches that have been implemented in other areas and shown to be effective.²⁵ The Abatement Plan also builds on abatement strategies currently being developed in the Cuyahoga and Summit communities.

35. For example, in February – March 2018, Summit County convened a group of government and other stakeholders in the County to identify resources, gaps, and barriers in the existing systems for responding to the opioid crisis.²⁶ The group also aimed to better meet treatment needs of adults with opioid addiction in contact with the criminal justice system. At this meeting, results of a recent Sequential Intercept Mapping (SIM) exercise were presented,

²⁵ See, for example: Centers for Disease Control and Prevention, Evidence-Based Strategies for Preventing Opioid Overdose: What's Working in the United States. 2018; U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, Facing Addiction in America: The Surgeon General's Spotlight on Opioids. Washington, DC: HHS, September 2018. National Academies of Sciences, Engineering, and Medicine. 2017. Pain management and the opioid epidemic: Balancing societal and individual benefits and risks of prescription opioid use. Washington, DC: The National Academies Press.

²⁶ See Summit County, Sequential Intercept Mapping and Action Planning for Opioid Epidemic Response, March 20, 2019 (SUMMIT_000349556).

which provided a comprehensive picture of how people with substance use disorders and co-occurring disorders flow through the Summit County criminal justice system, including six “intercept points” and an action plan.²⁷ The Abatement Plan adds resources at many of these intercept points to better connect individuals in need of opioid use treatment and other services to these services and implements many of the types of programs recommended in the mapping exercise.

36. Similarly, the Cuyahoga County Opiate Task Force has proposed and implemented a number of strategies to combat the opioid epidemic in conjunction with its partners, including, but not limited to: (1) increasing naloxone accessibility to the community by making the reversal kits available through pharmacies and Project DAWN locations; (2) educating local law enforcement on the benefits of carrying naloxone; (3) participating in bi-annual drug take-back days; (4) establishing medication drop boxes; (5) expanding substance use disorder services in MetroHealth emergency departments; (6) providing Safer Opioid Prescribing town hall trainings for prescribers; and (7) targeted media campaigns for heroin/fentanyl prevention and awareness.²⁸ The Abatement Plan incorporates and expands on many of these programs.

37. Furthermore, in their planning exercises, the Cuyahoga and Summit communities have recognized the need for improved coordination of systems to expand access to MAT. One of the tools for accomplishing this the Hub-and-Spoke Model, described in the Alexander Report, and previously implemented in Vermont.²⁹ The Hub-and-Spoke model uses a limited number of specialized, regional addictions treatment centers (called “hubs”) that collaborate with dispersed providers spread elsewhere in the community (called “spokes”). The hubs provide intensive treatment to patients and consult with medical providers treating patients in the general

²⁷ The six intercept points identified are Prevention/Treatment/Regulation, First Contact and Emergency Services, Initial Detention/Initial Court Hearings, Jails and Courts, Reentry, and Probation/Community Supervision.

²⁸ See Cuyahoga County Board of Health, “2018 Injury Prevention Report,” available at http://opiatecollaborative.cuyahogacounty.us/pdf_OpiateCollaborative/en-US/2018AnnualReport.pdf, pp. 2-3, 7; Cuyahoga County Opiate Task Force Report 2016, available at <http://www.ccbh.net/wp-content/uploads/2017/07/2016-CCOTF-Annual-Report.pdf>, at pp. 4, 5.

²⁹ Brooklyn, Johan and Stacey C. Sigmon, “Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact,” *Journal of Addiction Medicine* 2017, 11(4): 286-292.

practice spokes. Under this model, each MAT patient has an established hub, a single MAT prescriber, a pharmacy home, access to a general practice provider who are the medical community, and nurses and clinicians at spoke locations. The approach helps avoid coordination problems resulting from state and federal regulations that limit the ability of providers to offer different forms of MAT (e.g., methadone, buprenorphine, and naltrexone), and facilitates the provision of counselling and related services.

B. Elements of the Abatement Plan

38. As summarized in Figure 1 above, there are four elements of the Abatement Plan:

- Treatment for individuals with OUD
- Harm reduction, including widespread distribution of naloxone and resources for syringe exchanges;
- Primary prevention programs, including media campaigns, school-based prevention programs, and expanded resources for law enforcement; and
- System coordination to track the evolution of the epidemic, coordinate the different pieces of the abatement effort, and improve handoffs between the medical and criminal justice systems.

39. The remainder of this section briefly describes the key elements of the plan. Additional details of the Abatement Plan, including the parameters used in projecting costs, are presented in Appendix D, which presents the cost calculation and identifies the supporting data.

C. Overview of Treatment Services Under Abatement Plan

40. Treatment elements of the Abatement Plan include the provision of treatment services, such as detoxification, inpatient and outpatient therapy, recovery housing, and medication-assisted treatment (or MAT), resources for better connecting individuals to treatment services, and targeted interventions with high priority populations – those in jail, families in the child welfare system, and opioid-using pregnant women. Each of these is briefly addressed in turn.

1. Treatment Services: Non-MAT

41. The American Society of Addiction Medicine (ASAM) identifies the range of services a community needs to provide to appropriately treat addiction and substance-related disorders. These include services for managing withdrawal and related symptoms as well as the provision of a range of psychological counselling and support services. The Abatement Plan would expand the range and scale of services available in the Cuyahoga and Summit communities, including detoxification, residential, partial hospitalization, intensive outpatient, outpatient, recovery housing, and treatment facilities for parents with children.

42. Estimates of the cost of providing treatment services (other than MAT), including the costs of the facilities, under the Abatement plan are summarized in Appendix D, Tables C.1 and S.1 in Appendix D. The cost estimates anticipate that the number of individuals that receive treatment will ramp up over four years such that the number of individuals receiving treatment for OUD will double between 2020 and 2023.³⁰ I understand that the Expert Report of Anna Lembke explains that an effective Abatement Plan could expand its reach in this way by 2024.

2. Treatment Services: MAT

43. A central element of the Abatement Plan is to increase patient access to MAT including buprenorphine, methadone and naltrexone, as part of the broader treatment program. Estimates of the cost of providing MAT need to recognize that not all individuals with OUD will avail themselves of such programs and that it will take some time to equip enough providers with the capacity to offer expanded services. Program costs are estimated under the assumption that the share of individuals in treatment that receive MAT will increase from one-third to two-thirds within four years. Available evidence indicates that some individuals will need to receive MAT for many years and that rates of relapse and return to MAT are high so resources will be required through at least 2034 to ensure that patients continue to have access to MAT.

44. The cost estimates anticipate that the number of individuals who receive MAT in the Communities will expand over the next four years from approximately seven percent of the

³⁰ I assume that in 2020, 20% of individuals with OUD receive treatment in the Cuyahoga and Summit communities, based on the available data on treatment prevalence for individuals with OUD. See for example, SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2: "Only 20% with OUD received specialty addiction treatment."

OD population currently to approximately 27 percent. I understand that the Expert Report of Anna Lembke explains that an effective Abatement Plan could expand its reach in this way by 2024.

45. Estimates of the cost of providing MAT services under the plan are summarized in Appendix D Tables C.2 and S.2.

3. Recruiting Treatment Providers

46. The State of Ohio reports that “Ohio’s existing prescriber workforce is inadequate to meet the MAT need,” with only two percent of the physician workforce licensed to prescribe buprenorphine, and “most of these physicians are believed to be in the behavioral health field, which means that patients would have limited access to MAT through other physician practices like primary care . . .”³¹ A study of Ohio specialty treatment organizations found that half reported insufficient prescribing capacity.³² Lack of primary care physicians willing and equipped to manage patients receiving MAT is a major barrier to a successful “hub and spokes” model where specialty facilities manage patients through acute stages of their care and then hand patients off to primary care providers to manage the longer-term chronic phase of care.

47. In order to achieve the increased treatment levels described above, additional staff is needed to recruit primary care providers to obtain DEA licenses and become MAT providers. The Abatement Plan calls for funding of six full time nurse practitioners in Cuyahoga and Summit Counties to perform these services.

48. This estimate is presented in Appendix D, Tables C.3 and S.3.

4. Connecting Individuals to Services

49. As discussed above, it can be hard to coordinate treatment for opioid use disorder in Cuyahoga and Summit counties. Many of the hospital emergency departments lack the staff

³¹ Ohio Department of Mental Health and Addiction Services, Workforce development as Part of the 21st Century Cures Act.

³² Todd Molfenter, Carol Sherbeck, Mark Zehner, and Sandy Starr. Buprenorphine Prescribing Availability in a Sample of Ohio Specialty Treatment Organizations, J. Addictive Behav, Ther. Rehabil. 2015 4(2).

necessary to connect overdose patients to treatment. Treatment can be difficult to access outside of business hours, and there is a lack of resources to transport people to treatment.

50. The Abatement Plan includes staffing for a 24 hour a day / 7 days a week treatment connector hot line that could receive calls from individuals seeking treatment and from family members, emergency responders, or medical professionals trying to connect individuals to treatment services. It also includes resources to staff each major hospital emergency departments with social workers and recovery coaches who can connect individuals with substance use disorders to treatment. The Abatement Plan anticipates that new staff members will be required in Cuyahoga and Summit Counties to connect individuals to services. The plan also includes resources to pay for transportation to treatment sites for individuals who do not have a car.

51. The final component of “connections to services” is an expansion of web-based referral capacity. Research has shown that some individuals are more comfortable learning about treatment options and enrolling in treatment online rather than via a phone call or in person conversation.

5. Special Population: Child Welfare

52. The United States Department of Health and Human Services (HHS) concluded that parental “[s]ubstance use, including opioid misuse, has downstream effects on children’s welfare and family stability, and these in turn can place a substantial burden on communities.”³³ The HHS report further found that counties with higher rates of drug overdose deaths and drug-related hospitalizations also have higher child welfare caseload rates and that substance use related cases are associated with more complex and severe child welfare cases.³⁴

53. The Abatement Plan provides the following resources for child welfare-involved families:

- Additional social workers to allow smaller caseloads for case workers managing complex cases involving substance abuse;

³³ ASPE Research Brief, US Department of Health and Human Services, “The Relationship between Substance Use Indicators and Child Welfare Caseloads,” Revised March 9, 2018, p. 7.

³⁴ ASPE Research Brief, US Department of Health and Human Services, “The Relationship between Substance Use Indicators and Child Welfare Caseloads,” Revised March 9, 2018, p. 1.

- Family advocates – peer coaches who have themselves recovered from substance use -- to assist parents in addressing their addictions;
- A trauma counselor in each community to provide services and advice to staff members at the Divisions of Children and Family Services who are managing cases in which parents or caregivers have died from drug overdoses.;
- Additional employees in Cuyahoga and Summit Counties to recruit foster families for placements of children affected by the opioid epidemic.
- Boarding costs for the placement of affected children in foster care.

6. Special Populations: Pregnant Women

54. Prenatal exposure to drugs, and opioids in particular, have been an increasing issue in Ohio and in the Cuyahoga and Summit Communities. In 2016 alone, nearly 2,200 mothers in Ohio had an opioid drug abuse or dependence issue at the time of delivery.³⁵ Between 2013 and 2017 nearly 630 infants in Cuyahoga County and nearly 420 infants in Summit County were hospitalized due to Neonatal Abstinence Syndrome (NAS) resulting from exposure to opioids and other drugs in utero.³⁶

55. In addition to the treatment alternatives described above, the Abatement Plan provides resources for a maternal-infant home visiting program that provides specially trained nurses to regularly visit with new mothers and mothers-to-be with opioid use disorder to provide coaching on health and parenting, including substance use treatment.³⁷

³⁵ 2017 Ohio Neonatal Abstinence Syndrome Report, available at <https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/media/nas-datatable-2017>.

³⁶ 2017 Ohio Neonatal Abstinence Syndrome County Report, available at https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/resources/NAS_Hospital_Reporting_in_Ohio.

³⁷ The federal program is described at: https://mchb.hrsa.gov/sites/default/files/mchb/MaternalChildHealthInitiatives/HomeVisiting/pdf/program_brief.pdf

7. Special Population: Jails

56. It is widely recognized that a substantial share of jail inmates have substance misuse problems.³⁸ The high OUD rates create challenges for the jail system: inmates going through detoxification require medical attention and additional staff care. However, currently both Cuyahoga and Summit County jails typically house such inmates within the general population. As a result, at times inmates need to be transported and housed in a hospital during this process at significant expense to the counties. And without sufficient resources to be able to start substance abuse treatment while inmates are in jail or to connect them effectively to treatment options upon release, the jails observe individuals committing opioid-related offenses soon after release and cycling back into jail.

57. The Abatement Plan would approximately double substance abuse treatments at Cuyahoga County's Bedford Heights and Euclid facilities and would add a detoxification unit at Cuyahoga County jail. Services also will be expanded in Summit County. Plans call for hiring additional social workers in Cuyahoga and Summit Counties to connect newly released inmates with OUD with treatment and transition services. Transitional housing also would be made available to a portion of inmates with OUD being released from prison.

D. Overview of Harm Reduction Services Under the Abatement Plan

1. Naloxone

58. Naloxone is an opioid antagonist that has proven to be highly successful in reducing mortality when delivered to individuals experiencing an opioid-related overdose.³⁹ Naloxone is often administered by first responders, such as individuals from the divisions of Emergency Medical Services, Fire and Police. However, first responders may not arrive in time to administer naloxone and prevent a death. Indeed, the communities have already begun distributing naloxone kits to individuals through Project DAWN programs. I understand that Dr. Theodore Parran explains that fatalities from opioid-related overdoses would be reduced if naloxone kits were made more widely available to individuals with OUD, to their friends and

³⁸ CUYAH_003505168 ("The CCCC currently provides housing and services for 26,000 inmates annually, the majority are inmates under a pre-trial status. Of this population, approximately 75% have a substance use disorder.")

³⁹ See National Institute on Drug Abuse, "Opioid Reversal with Naloxone (Narcan, Evzio)," revised April 2018, available at <https://www.drugabuse.gov/related-topics/opioid-overdose-reversal-naloxone-narcan-evzio>.

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family members, and if kits continue to be available to all first responders in the communities. He recommends that, on a community-wide basis, 3 to 9 doses (1.5 to 4.5 naloxone kits) be made available for each opioid-dependent individual, including individuals in treatment. Kits would be made available to the individuals, as well as their relatives and close friends.

59. Recognizing that not all individuals with OUD and their family and friends would take advantage of the plan, the Abatement Plan anticipates that two naloxone kits would be distributed in the community per year for each individual with OUD. These kits have a shelf life of two years and thus will need to be replaced regularly, even if not used. The Abatement Plan also provides for two public health employees in Cuyahoga County and one in Summit County to coordinate the logistics of the distribution program.

60. The Abatement Plan also continues to provide for sufficient naloxone availability for all first responders in the communities. In particular, based on 2017 purchasing data for the City of Cleveland the plan assumes that approximately 12,000 doses of naloxone will be purchased each year in Cuyahoga County and approximately 5,200 doses of naloxone will be purchased in Summit County, both to replace naloxone doses that have been used and those that have expired.

61. Appendix D Tables I, C.8 and S.8 reports estimates of Naloxone-related costs under the Abatement Plan.

2. Syringe Exchange Programs

62. Both communities operate needle exchange programs where intravenous drug users can exchange used needles for clean needles. Such programs have been shown to reduce infections with HIV and hepatitis C. In addition, these programs can counsel drug users on treatment options, encourage users to be tested for HIV and hepatitis C, and distribute fentanyl strips. The Abatement Plan would increase the number of syringe exchange locations in each community and expand the hours that they are open. Specifically, it would increase the needles exchanged in Cuyahoga County by 50 percent and the needles exchanged in Summit County by two-thirds.

63. Appendix D, Tables C.9 and S.9 report estimates of costs of the Syringe Exchange Program.

3. HIV/Hepatitis C Interventions

64. Intravenous use of heroin and other opioids is associated with an elevated risk of infection with HIV and hepatitis C.⁴⁰ Treating those infected with HIV and hepatitis C can reduce the harm to the individuals and reduce the spread of these diseases to others. The abatement plan includes resources for individuals who inject opioids to receive screening for HIV and hepatitis C, as well as resources to treat those whose HIV and hepatitis C was obtained from injection of opioids.

4. Social Support Housing

65. Research shows that unstable housing is associated with a higher risk of overdose death among those with substance use disorders.⁴¹ The Abatement Plan proposes to provide two kinds of housing resources. The first is transitional housing for individuals with a history of opioid misuse being released from jail or prison.⁴² The second is permanent supportive housing for homeless individuals with a history of opioid misuse.

E. Overview of Prevention Services Under the Abatement Plan

66. The primary prevention portion of the Abatement Plan aims to prevent individuals from becoming opioid users and misusers. It would allocate resources for a community-wide media campaign, for school-based prevention programs, for medical provider education and outreach, for drug disposal programs, and for law enforcement interventions. Each of these is briefly addressed in turn.

1. Media Campaigns

67. Media campaigns can play several important roles in combatting the opioid epidemic. First, they can educate individuals about the risks associated with prescription opioids so that they can make informed decisions about approaches to pain management. Second, they can educate individuals about the safe use of opioids, such as the benefits of keeping the duration

⁴⁰ <https://www.drugabuse.gov/publications/research-reports/heroin/why-are-heroin-users-special-risk-contracting-hiv-aids-hepatitis-b-c>

⁴¹ For example, a Massachusetts Department of Health study found that the opioid-related death rate for individuals experiencing homelessness was 16 to 30 times greater than the rest of the population. (<https://www.mass.gov/files/documents/2017/08/31/data-brief-chapter-55-aug-2017.pdf>)

⁴² This component is covered in the Special Populations: Jails cost category.

of prescription opioid use as short as possible and of disposing of unused pills. Third, they can make individuals aware of specific resources available in their community such as drug disposal programs. Fourth, media campaigns can reduce the stigma associated with seeking treatment and also provide information to individuals about how to access treatment. The Abatement Plan provides resources to each community in line with prior successful public health media campaign's such as the FDA's "The Real Cost" media campaign to prevent youth from using tobacco.⁴³

68. The cost estimates are provided in Appendix D Tables C.12 and S.12.

2. School-based Prevention Programs

69. The proposed school-based prevention program combines an evidence-based universal prevention effort with intensive referral and case-management effort for students showing early signs of being at risk for substance abuse.

70. Evidence-based school-wide programs such as LifeSkills Training (LST) and Project Towards No Drug Abuse (TND) have been shown to reduce adolescent substance use in multiple randomized trials demonstrating long-term effects.⁴⁴ In the abatement plan, I assume that programming is delivered to every student from sixth grade through twelfth grade – approximately 106,000 students in the Cuyahoga community and approximately 46,000 in the Summit community. Schools can also play an important role in identifying students who are showing early signs of being at risk for substance abuse and connecting those students to services. School districts such as New Haven have set up and staffed programs in which educators within each school meet regularly to review the list of students who need services and then follow up to make sure the connections to services actually occur.⁴⁵ The abatement plan provides resources so that every high school and middle school in the Communities has a

⁴³ MacMonegle, Anna J., James Nonnemaker, Jennifer C. Duke, Matthew C. Farrelly, Xiaoquan Zhao, Janine C. Delahanty, Alexandria A. Smith, Pamela Rao and Jane A. Allen. "Cost-Effectiveness Analysis of The Real Cost Campaign's Effect on Smoking Prevention." *American Journal of Preventive Medicine* 55 no. 3 (2018): 319-325.

⁴⁴ Kris Glunt, "School-based Substance Abuse Prevention," EPISCenter, available at <http://www.episcenter.psu.edu/sites/default/files/Presentations/SSC%20Presentation.pdf>, pp. 8, 17-19, 26, 34.

⁴⁵ https://www.newhavenct.gov/gov/depts/youth_services/stat.htm.

sufficient number of social workers to coordinate the school's efforts to connect at risk youth to services.

71. The cost estimates are provided in Appendix D, Tables C.13 and S.13.

3. Medical Provider Education and Outreach

72. Studies have found that medical system quality improvement efforts that educate providers about appropriate prescribing practices can significantly reduce opioid overprescribing. For example, a recent study of a coordinated effort by a medical system in Maryland found that a combination of provider education and accountability, enhanced oversight, tools to right-size postoperative discharge prescriptions, and reduction of default amount on standard opioid prescription orders resulted in a 58 percent decline in morphine milligram equivalents per clinical encounter.⁴⁶ The Abatement Plan would fund individuals to work with provider groups and medical systems to educate providers, address overprescribing, and spread best prescribing practices.

4. Drug Disposal Programs

73. Both communities have drug disposal programs including drug drop box sites and "take back your meds" events. The abatement plan provides resources to double the number of drop boxes installed as well as the number of events.

5. Law Enforcement

74. In both Cleveland and Akron, police officials report that the opioid epidemic has required their departments to redeploy resources from other policing activities. In Cleveland, an entire unit that was previously dedicated to disrupting the activities of drug dealers, today is instead assigned to investigate drug overdose deaths.⁴⁷ In Akron, a two-person team investigates overdose deaths; the department notes that each requires an investigation with a similar level of detail as a homicide.⁴⁸ In Cleveland, police officials estimated that it would require an additional 20-25 officers to return to the level of service that was provided before the opioid epidemic and

⁴⁶ Barry R. Meisenberg, MD; Jennifer Grover, PA; Colson Campbell, BS; Daniel Korpon, MS. Assessment of Opioid Prescribing Practices Before and After Implementation of a Health System Intervention to Reduce Opioid Overprescribing. JAMA Open Network, September 28, 2018.

⁴⁷ Deposition of Gary Gingell, November 20, 2018, pp. 237, 175-176.

⁴⁸ See AKRON_001121744 and AKRON_001121745

in Akron, at least two additional officers are needed to investigate overdose deaths.⁴⁹ The Abatement Plan provides additional staffing to community law enforcement agencies to investigate overdose deaths.

75. Additionally, both the city and county prosecutor's offices in the Communities have had to divert resources from prosecuting other crimes to prosecuting opioid related offenses. The Abatement Plan provides additional prosecutors to the community who can focus on prosecuting opioid-related crime.

F. System Coordination

76. The Abatement Plan would dedicate a large amount of resources toward preventing and treating opioid addiction and avoiding and reducing the harms associated with improper opioid use. Achieving maximum impact will require effective coordination of the different pieces of the plan and of the different community partners responsible for implementing the different pieces. It will also require the ability to track progress and unmet needs using high-frequency data so as to reallocate resources to their highest value use as the nature of the epidemic evolves. Toward these ends, the Abatement Plan includes resources to system coordination.

1. Tracking Abatement Progress

77. In the Cuyahoga and Summit communities, the County Medical Examiners perform two important functions that are critical to the communities' ability to track and quickly respond to changing patterns of opioid use. First, they perform autopsies that can determine what substances were responsible for overdose deaths. Second, they test drugs seized by police to determine what the substances are. The rise in overdose deaths and in the need for testing of drugs has resulted in an unsustainable work load for the medical examiner offices. The Abatement Plan would add staff to the Cuyahoga medical examiner's office and the Summit medical examiner's office. In addition, competition for trained forensic staff is increasing as similar offices around the country attempt to expand their capacity, and the Cuyahoga and Summit medical examiners offices face serious retention challenges. To enable these offices to

⁴⁹ See Deposition of Gary Gingell, November 20, 2018, pp. 243-244; AKRON_001121745.

retain their skilled staff members, the Abatement Plan includes a raise for medical examiner staff.

2. Court System Resources

78. The court systems in each community perform important roles in connecting individuals to treatment services. However, there are often several-week delays between when referrals to services are made and when assessments occur and then further delays before treatment can begin.⁵⁰ The Abatement Plan provides each community's court system with additional staff members who would 1) keep judges up to date on treatment options in the community; 2) track the docket of individuals who have been referred to drug treatment services to measure how quickly connections to services are being made; 3) intervene with service providers to reduce treatment delays; and 4) represent the court system in the abatement initiative systems re-engineering processes.

3. Data Informed Systems Re-Engineering and Management

79. The Abatement Plan would provide each community with funding to set up a team to coordinate the overall effort and to work with the multitude of government agencies, medical institutions, and service providers to troubleshoot problems, develop continuous improvement efforts, and identify opportunities to re-engineer how individuals are connected to services to reduce the number of people who fall through the cracks. The team would be responsible for establishing high frequency (weekly and monthly) metrics for tracking the progress and efficacy of the Abatement Plan and for convening relevant stakeholders to collaboratively review the metrics and determine how to take action so as to maximize the number of residents who receive needed treatment, minimize the harms associated with opioid use, and reduce the flow of new individuals who use or become addicted to opioids. The abatement Plan envisions a five-person team in each community made up of an executive director, two program managers, one data analyst, and one staff assistant.

⁵⁰ Summit County, Sequential Intercept Mapping and Action Planning for Opioid Epidemic Response, March 20, 2019 (SUMMIT_000349556), at p. 15; Comment by D. Skoda at Roundtable Meeting with Summit County Community Members, July 11, 2018.

VII. ESTIMATED COST OF ABATEMENT PLAN

80. Tables 1 and 2 summarize the costs of the Abatement Plan for the programs evaluated to date for Cuyahoga and Summit, respectively. These costs include both the costs of continuing current efforts to abate the opioid epidemic and the additional costs associated with the expansion in services envisioned in the Plan.

81. It is anticipated that it will take four years to phase in the plan, with costs rising in each year from 2020 through 2023. To illustrate the annual cost of the plan once fully implemented, the first column shows the annual cost in year 5 of the plan (2024). Annual costs for the elements of the Abatement Plan evaluated to date are estimated to be \$248 million in Cuyahoga and \$108 million in Summit in 2024.⁵¹

82. The base case reflects the Experts' view that 2024 level of treatment will be needed for at least another 10 years after that date. I understand that the Expert Report of Anna Lembke explains that the current and future stock of people who have experienced OUD will lead to recurring treatment needs in the future both because some individuals will need to receive treatment for many years and because others will relapse and require renewed treatment. Thus, any decline in treatment needs from a decline in new OUD cases will be offset by greater needs associated with the growing stock of people with continuing treatment needs.⁵²

⁵¹ Annual costs for each year from 2020 through 2034 are provided in the accompanying detailed tables

⁵² The resource needs for some components of the Abatement Plan are assumed to decline over time. For example, as more individuals receive MAT, the plan envisions a decline in overdoses and reduced need to replace first responder supplies of naloxone.

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Table 1
Summary of Abatement Costs, Cuyahoga County

\$ in millions	Annual Cost:	15-Year Estimate: 2020-2034			Source	
	Year 5 (2024)	Low	Base	High		
<u>TREATMENT</u>						
[1]	Treatment (Excl. MAT)	\$184.7	\$2,602.8	\$3,012.4	\$3,421.9	Table C.1
[2]	Medication-Assisted Treatment (MAT)	\$40.4	\$515.2	\$595.9	\$676.5	Table C.2
[3]	Recruiting PCPs to Provide MAT	\$0.5	\$9.0	\$9.0	\$9.0	Table C.3
[4]	Connecting Individuals to Services	*	*	*	*	
[5]	Special Populations: Child Welfare	*	*	*	*	
[6]	Special Populations: Pregnant Women	*	*	*	*	
[7]	Special Populations: Jails	*	*	*	*	
<u>HARM REDUCTION</u>						
[8]	Naloxone	\$4.5	\$66.8	\$72.6	\$78.4	Table C.8
[9]	Syringe Exchange Programs	\$0.7	\$10.9	\$11.3	\$11.8	Table C.9
[10]	HIV/Hep C Interventions	*	*	*	*	
[11]	Social Support Housing	*	*	*	*	
<u>PREVENTION</u>						
[12]	Media Campaign	\$1.2	\$18.5	\$18.5	\$18.5	Table C.12
[13]	School-Based Prevention	\$16.1	\$264.0	\$264.0	\$264.0	Table C.13
[14]	Medical Provider Education	*	*	*	*	
[15]	Drug Disposal Programs	*	*	*	*	
[16]	Law Enforcement Interventions	*	*	*	*	
<u>SYSTEM COORDINATION</u>						
[17]	Medical Examiner Resources	*	*	*	*	
[18]	Criminal Justice System Coordination	*	*	*	*	
[19]	Data-Informed Systems Re-Engineering & Mgmt	*	*	*	*	
ABATEMENT COST, TOTAL		\$248.2	\$3,487.2	\$3,983.7	\$4,480.2	

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Table 2
Summary of Abatement Costs, Summit County

\$ in millions	Annual Cost: Year 5 (2024)	15-Year Estimate: 2020-2034			Source	
		Low	Base	High		
<u>TREATMENT</u>						
[1]	Treatment (Excl. MAT)	\$80.5	\$1,136.1	\$1,313.1	\$1,490.1	Table S.1
[2]	Medication-Assisted Treatment (MAT)	\$17.5	\$222.7	\$257.5	\$292.4	Table S.2
[3]	Recruiting PCPs to Provide MAT	\$0.3	\$4.5	\$4.5	\$4.5	Table S.3
[4]	Connecting Individuals to Services	*	*	*	*	
[5]	Special Populations: Child Welfare	*	*	*	*	
[6]	Special Populations: Pregnant Women	*	*	*	*	
[7]	Special Populations: Jails	*	*	*	*	
<u>HARM REDUCTION</u>						
[8]	Naloxone	\$2.1	\$31.0	\$33.5	\$36.1	Table S.8
[9]	Syringe Exchange Programs	\$0.5	\$7.1	\$7.4	\$7.7	Table S.9
[10]	HIV/Hep C Interventions	*	*	*	*	
[11]	Social Support Housing	*	*	*	*	
<u>PREVENTION</u>						
[12]	Media Campaign	\$0.5	\$8.1	\$8.1	\$8.1	Table S.12
[13]	School-Based Prevention	\$7.0	\$114.0	\$114.0	\$114.0	Table S.13
[14]	Medical Provider Education	*	*	*	*	
[15]	Drug Disposal Programs	*	*	*	*	
[16]	Law Enforcement Interventions	*	*	*	*	
<u>SYSTEM COORDINATION</u>						
[17]	Medical Examiner Resources	*	*	*	*	
[18]	Criminal Justice System Coordination	*	*	*	*	
[19]	Data-Informed Systems Re-Engineering & Mgmt	*	*	*	*	
ABATEMENT COST, TOTAL		\$108.3	\$1,523.5	\$1,738.2	\$1,952.9	

83. There is, however, uncertainty about the extent of future treatment needs. For example, the Abatement Plan assumes that 1.4 percent of the adult population in each community has opioid use disorder, based on an estimate reported by Pitt et al. Pitt et al. adjust NSDUH estimate of the OUD population upward by roughly 70 percent to correct for underreporting and for populations like the homeless and incarcerated who are not included in the NSDUH sampling frame.⁵³ This adjustment may be conservative based on a 2018 Massachusetts study which estimates that the number of people with OUD could be more than

⁵³ Pitt, Allison L., Keith Humphreys and Margaret L. Brandeau. "Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic." *AJPH Open Themed Research* Vol. 108 no. 10 (Oct 2018): 1394-1400, at Supplement pp. S3-S4.

four times the NSDUH estimate.⁵⁴ Moreover, it eventually may be possible to recruit more than 40 percent of the OUD population into treatment. For both of these reasons, treatment costs could be higher than in the base case. Alternatively, it is possible that changes in prescribing practices and other prevention efforts will reduce the flow of new OUD cases faster than currently anticipated and that treatment costs will therefore be lower than in the base case.

84. To illustrate the sensitivity of the base case estimates to alternative assumptions about future treatment needs, Tables 1 and 2 present “high” and “low” estimates in addition to the base case.⁵⁵ The high estimate assumes that treatment needs increase over ten years to 1.33 times the 2024 level. The low estimate assumes treatment needs decline over ten years to two-thirds of the 2024 level. In Cuyahoga, the 15-year costs for the elements of the Abatement Plan evaluated to date range from \$3.5 billion to \$4.5 billion. In Summit, the 15-year costs range from \$1.5 billion to \$2.0 billion.

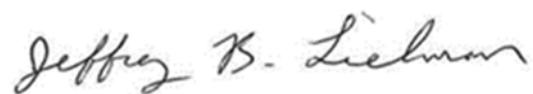
85. The Abatement Plan described in this report reflects the information available to me at the time of its writing and my best judgment about the needs in the two communities. When it becomes time to implement the actual Plan, it will be important to update the Plan based upon the latest information and conditions on the ground in Cuyahoga and Summit and to have a more intensive process of engaging community members and local experts so as to ensure the most effective possible implementation of the Abatement Plan for the Cuyahoga and Summit Communities.

⁵⁴ Barocas, et al, “Estimated Prevalence of Opioid Use Disorder in Massachusetts, 2011-2015: A Capture-Recapture Analysis.” *American Journal of Public Health*, 2018, 108:12, 1675-1681.

⁵⁵ In addition to the treatment variations described here, low and high case estimates are also presented in Tables C.8 and S.8 (naloxone) and C.9 and S.9 (syringe exchange programs).

Confidential

March 25, 2019

A handwritten signature in cursive script, reading "Jeffrey B. Liebman". The signature is written in dark ink on a white background.

Jeffrey B. Liebman

March 2019

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Current Positions:

Malcolm Wiener Professor of Public Policy, Kennedy School of Government, Harvard University, 2006-present.
 Director, Taubman Center for State and Local Government, 2015-present.
 Director, Rappaport Institute for Greater Boston, 2015-present.
 Founder and Director, Harvard Kennedy School Government Performance Lab, 2011-present.
 Research Associate, National Bureau of Economic Research, 2005-present.
 Co-organizer, NBER Working Group on Social Security.
 Associate Director, NBER Retirement Research Center and NBER Disability Research Center, 2011-2015.

Previous Positions:

Acting Deputy Director, Office of Management and Budget, 2010.
 Executive Associate Director and Chief Economist, Office of Management and Budget, 2009.
 Special Assistant to the President for Economic Policy, White House National Economic Council, 1998-1999.
 Assistant Professor of Public Policy, Kennedy School of Government, Harvard University, 1996-2001.
 Associate Professor of Public Policy, Kennedy School of Government, Harvard University, 2001-2005.
 Professor of Public Policy, Kennedy School of Government, Harvard University, 2005-2006.
 Faculty Research Fellow, National Bureau of Economic Research, 1996-2005.
 Harvard Kennedy School Area Chair for Social Policy, 2005-2007.
 Director, Harvard University Multidisciplinary Program in Inequality and Social Policy, 2005-2007.

Education:

Ph.D., Economics, 1996	Harvard University
B.A. <i>magna cum laude</i> , distinction in Economics and Political Science, 1989	Yale University

Honors and Fellowships:

Elected to National Academy of Social Insurance, 2002.
 NBER Center for Aging, Demography Research Fellow, 2001-2002.
 Alfred P. Sloan Foundation Doctoral Dissertation Fellowship, 1995-1996.
 Tinker Foundation Fellowship for research in Mexico, summer 1992.
 National Science Foundation Graduate Fellowship, 1991-1994.
 Yale University, Ronald Meltzer Economics Award for the outstanding senior essay in major, 1989.

Research Grants:

Bloomberg Philanthropies grant to fund Government Performance Lab work on results-driven contracting, 2015-2021.
 John and Laura Arnold Foundation grants to fund Government Performance Lab 2013-2020.

Rockefeller Foundation grant to expand Social Impact Bond Technical Assistance Lab, 2012-2015.
 Dunham Fund grant to expand Social Impact Bond Technical Assistance Lab, 2013-2015.
 Smith Richardson Foundation grant for "Building an Evidence Base for Disability Insurance Reform" (with Jack Smalligan), 2012-2013.
 Rockefeller Foundation grant to establish a "Social Impact Bond Technical Assistance Lab," 2011-2013.
 National Institutes of Health (NIA), "Building Integrated Models of Retirement: Three Approaches," 2007-2012.
 NBER-SSA Retirement Research Center grant for "The Taxation of Social Security Benefits as an Approach to Means Testing," 2007-2008.
 NBER-SSA Retirement Research Center grant for "The Perception of Social Security Incentives for Labor Supply and Retirement" (with Erzo Luttmer), 2007-2008.
 NBER-SSA Retirement Research Center grant for "Labor Supply Responses to the Social Security Tax-Benefit Link" (with Erzo Luttmer), 2006-2007.
 NBER-SSA Retirement Research Center grant for "How Should Changes in Population Health Affect Retirement Ages?" (with David Cutler), 2006-2007.
 NBER-SSA Retirement Research Center grant for "Could Social Security Eliminate Poverty Among the Elderly?", 2005-2006.
 NBER-SSA Retirement Research Center grant for "Earnings Responses to Raising the Social Security Taxable Maximum?" (with Emmanuel Saez), 2004-2005.
 NBER-SSA Retirement Research Center grant for "How Fast Should the Social Security Retirement Age Rise?" (with David Cutler), 2003-2004.
 National Institutes of Health (NIA) First Award for "Protecting the Poor While Reforming Social Security," 1999-2004.
 Russell Sage Foundation Grant for "Reforming Tax and Transfer Programs in Order to Assist Low-skilled Workers," 1997-2000.
 National Institute of Child Health and Human Development grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2001-2004.
 Russell Sage Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2000-2006.
 Smith Richardson Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2000-2003.
 William T. Grant Foundation grant for "Effects of High-Poverty Neighborhoods on Youth" (with Lawrence Katz and Jeffrey Kling), 2001-2004.
 MacArthur Foundation grant for "Moving to Opportunity and Family Well-being" (with Lawrence Katz, Jeffrey Kling, Jeanne Brooks-Gunn, and Greg Duncan), 2001-2002.
 Robert Wood Johnson Foundation grant for "Moving to Opportunity and Family Well-being" (with Lawrence Katz, Jeffrey Kling, Jeanne Brooks-Gunn, and Greg Duncan), 2001-2002.
 U.S. Department of Housing and Urban Development grant for "Expanding Moving to Opportunity Research" (with Lawrence Katz and Jeffrey Kling), 2000-2006.
 US Department of Housing and Urban Development grant, 1995-2000, for "Moving to Opportunity in Boston" (with Lawrence Katz and Jeffrey Kling).
 NBER-NIA Center for Aging and Health Research grant for "Health Outcomes in MTO" (with Lawrence Katz and Jeffrey Kling), 1997-1998.

Journal Articles and Book Chapters:

Research on Housing Policy and Neighborhood Effects

1. "Moving to Opportunity in Boston: Early Outcomes of a Housing Mobility Program" (with Lawrence Katz and Jeffrey Kling), *Quarterly Journal of Economics*, May 2001.

2. "Boston Site Findings: The Early Impacts of Moving to Opportunity" (with Lawrence Katz and Jeffrey Kling), in *Choosing a Better Life? Evaluating the Moving to Opportunity Social Experiment*, edited by John M. Goering and Judith D. Feins (Washington: Urban Institute Press), 2003.
3. "Bullets Don't Got No Name: Consequences of Fear in the Ghetto" (with Lawrence Katz and Jeffrey Kling), in *Discovering Successful Pathways in Children's Development: New Methods in the Study of Childhood and Family Life*, edited by Thomas S. Weisner (Chicago: University of Chicago Press), 2004.
4. "Experimental Analysis of Neighborhood Effects" (with Jeffrey Kling and Lawrence Katz), *Econometrica*, January 2007.
5. "What Can We Learn About Neighborhood Effects from the Moving to Opportunity Experiment?" (with Jens Ludwig, Jeffrey Kling, Greg Duncan, Larry Katz, Ronald Kessler, and Lisa Sanbonmatsu), *American Journal of Sociology*, 114, July 2008.

Research on Executive Compensation

5. "Are CEOs Really Paid Like Bureaucrats?" (with Brian Hall), *Quarterly Journal of Economics*, August 1998.
6. "Taxation and Executive Compensation" (with Brian Hall), *Tax Policy and the Economy*, 14, 2000.

Research on the Earned Income Tax Credit

7. "Labor Supply Response to the Earned Income Tax Credit" (with Nada Eissa), *Quarterly Journal of Economics*, May 1996. Reprinted in Alan Auerbach, editor, *Public Finance*, Worth Series in Outstanding Contributions, 2000.
8. "The Impact of the Earned Income Tax Credit on Incentives and Income Distribution," *Tax Policy and the Economy*, 12, 1998.
9. "Who are the Ineligible Earned Income Tax Credit Recipients?" *National Tax Journal*, December 2000.
10. "The Optimal Design of the Earned Income Tax Credit," in *Making Work Pay: The Earned Income Tax Credit and Its Impact on American Families*, edited by Bruce D. Meyer and Douglas Holtz-Eakin (New York: Russell Sage Foundation Press), 2002.
11. "The EITC Abroad: Implications of the British WFTC for Pay-as-you-earn Administration of the EITC," (with Janet Holtzblatt), *Proceedings of the National Tax Association*, 1999.
12. "Would People Behave Differently If They Better Understood Social Security? Evidence from a Field Experiment" (with Erzo Luttmer), *American Economic Journal: Economic Policy*, 7(1), 2015.

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13. "The Perception of Social Security Incentives for Labor Supply and Retirement: The Median Voter Knows More than You'd Think" (with Erzo Luttmer), *Tax Policy and the Economy*, 26, 2012.
14. "Labor Supply Responses to Marginal Social Security Benefits: Evidence from Discontinuities" (with Erzo Luttmer and David Seif), *Journal of Public Economics*, 93, December 2009.
15. "Redistribution in the Current U.S. Social Security System," in *The Distributional Aspects of Social Security and Social Security Reform*, edited by Martin Feldstein and Jeffrey B. Liebman (Chicago: University of Chicago Press), 2002.
16. "The Distributional Effects of an Investment-based Social Security System" (with Martin Feldstein), in *The Distributional Aspects of Social Security and Social Security Reform*, edited by Martin Feldstein and Jeffrey B. Liebman (Chicago: University of Chicago Press), 2002.
17. "Social Security" (with Martin Feldstein), in *Handbook of Public Economics*, edited by Alan J. Auerbach and Martin Feldstein (Amsterdam: Elsevier), volume 4, 2002.

Research on Tax and Budget Policy

18. "Independent Taxation, Horizontal Equity, and Return-Free Filing" (With Daniel Ramsey), *Tax Policy and the Economy* 33, forthcoming 2019.
19. "Do Expiring Budgets Lead to Wasteful Year-End Spending? Evidence from Federal Procurement" (with Neale Mahoney), *American Economic Review*, 107(11), 2017.
20. "Social Security and National Saving in an Era of Budget Surpluses" (with Douglas Elmendorf), *Brookings Papers on Economic Activity*, 2, 2000.
21. "The Middle Class Parent Penalty: Child Benefits in the U.S. Tax Code" (with David Ellwood), *Tax Policy and the Economy*, 15, 2001.
22. "Fiscal Policy and Social Security Policy During the 1990s" (with Douglas Elmendorf and David Wilcox), in *American Economic Policy in the 1990s*, edited by Jeffrey Frankel and Peter Orszag (Cambridge: MIT Press), 2002.
23. "Saving Incentives for Low- and Middle-income Families: Evidence from a Field Experiment with H&R Block (with Esther Duflo, William Gale, Peter Orszag, and Emmanuel Saez), *Quarterly Journal of Economics*, November 2006.
24. "Simple Humans, Complex Insurance, Subtle Subsidies" (with Richard Zeckhauser), in *Using Taxes to Reform Health Insurance: Pitfalls and Promises*, edited by Henry Aaron and Leonard Burman (Washington, Brookings Institution), 2008.
25. "The Deterioration in the U.S. Fiscal Outlook, 2001–2010," *Tax Policy and the Economy*, 27, 2013.
26. "The Decline, Rebound, and Further Rise in SNAP Enrollment: Disentangling Business Cycle Fluctuations and Policy Changes" (with Peter Ganong), *American Economic Journal: Economic Policy*, 10:4, 2018.

Working Papers:

27. "How Fast Should the Social Security Eligibility Age Rise?" (with David Cutler, Seamus Smyth, and Mark Shepard).
28. "Earnings Responses to Increases in Payroll Taxes" (with Emmanuel Saez).
29. "Schmeduling" (with Richard Zeckhauser).

Books Edited:

Distributional Aspects of Social Security and Social Security Reform (with Martin Feldstein), (Chicago: University of Chicago Press), 2002.

Social Security Policy in a Changing Environment (with David Wise and Jeffrey Brown), (Chicago: University of Chicago Press), 2009.

Other Writings:

"How Cities Can Improve Their Procurement of Goods and Services" (With Hanna Azemati), in *Retooling Metropolis*, Manhattan Institute, 2016.

Social Impact Bonds: A Guide for State and Local Governments (with Alina Sellman), Harvard SIB Lab, June 2013.

Building on Recent Advances in Evidence-Based Policymaking, Brookings Hamilton Project and America Achieves, April 2013.

"An Evidence-Based Path to Disability Insurance Reform" (with Jack Smalligan) in *15 Ways to Rethink the Federal Budget*, Brookings Hamilton Project, February 2013.

"Social Impact Bonds: Lessons Learned So Far" (with SIB Lab team) in *Community Development Investment Review*, Federal Reserve Bank of San Francisco, February 2013.

"The Baby Boom Bump" (with Kenneth Baer), *New York Times*, December 6, 2012.

"The End of Health Insurance Companies" (with Ezekiel Emanuel), *New York Times Opinionator*, January 30, 2012.

"Cut Medicare, Help Patients" (with Ezekiel Emanuel), *New York Times*, August 22, 2011.

Social Impact Bonds: A Promising New Financing Model to Accelerate Social Innovation and Improve Government Performance, Center for American Progress, February 2011.

"Social Security Meets Race," *Science*, September 23, 2005, p. 1965.

"Reforming Social Security: Not All Privatization Schemes Are Created Equal." *Harvard Magazine*, March-April, 2005.

Moving to Opportunity: Interim Impacts Evaluation (with Larry Orr, Judith Feins, Robin Jacob, Erik Beecroft, Lisa

Sanbonmatsu, Jeffrey Kling, and Lawrence Katz). Washington D.C.: U.S. Department of Housing and Urban Development, 2003.

The Role of Annuities in a Reformed U.S. Social Security System. December 2002. AARP Public Policy Institute report 2002-17.

“Is Social Security Unfair to the Poor?” Op-ed, *Washington Post*, July 29, 2001.

“Personal Accounts and Social Security,” Letter to the Editor, *Washington Post*, July 9, 2001.

“The Earned Income Tax Credit.” Testimony provided to the Committee on Finance, United States Senate, Washington, D.C., March 7, 2001.

“The EITC Compliance Problem,” *Poverty Research News*, Summer 1998, Joint Center for Poverty Research.

“Tax Credit Combines Best of Two Systems,” Op-ed, *Financial Times*, March 17, 1998.

“Blair Could Learn From US Tax Credit Scheme,” Letter to the Editor, *Financial Times*, June 23, 1997.

Lessons About Tax-benefit Integration from the US Earned Income Tax Credit Experience. Joseph Rowntree Foundation. York, England. 1997.

Teaching:

Public Economics (PhD field course), Harvard Economics Department. 2006, 2007, 2008, 2011.

Economic Analysis of Public Policy (public finance), Harvard Kennedy School. 1997, 2000, 2001, 2003, 2004, 2005, 2008, 2011, 2012, 2014, 2015, 2016, 2017, 2018, 2019.

Government Turnarounds, Harvard Kennedy School. 2017, 2018.

Empirical Methods II (regression analysis and program evaluation), Harvard Kennedy School. 1997, 1998.

Tax and Budget Policy, Harvard Kennedy School. 2000.

Doctoral Research Seminar, Harvard Kennedy School. 2000, 2001.

American Economic Policy, Harvard Economics Department (undergraduate) and Harvard Kennedy School. 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018.

New Members of Congress Program (presentations on Social Security and Medicare and economic outlook). 2000, 2002, 2012.

Proseminar on Inequality and Social Policy (PhD students), Harvard Department of Sociology and Harvard Kennedy School. 2005, 2007, 2010.

MATERIALS CONSIDERED

Date	Author	Title	Source
11/7/2018	Gilson	Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2018 October Update	https://www.news-herald.com/news/cuyahoga-county
10/1/2018		Summit County Public Health: Population Health vital Statistics Brief: Vol. 3: Drug Overdoses, Oct 1-30, 2018	www.SCPH.org
12/17/2018		Summit County Opiate Task Force Quarterly Dashboard	
	Wexelblatt, Ford	Maternal Fetal Issues for Physicians: Optimal Care for Infants with neonatal abstinence syndrome, Presentation to the National RX Drug Abuse Summit	https://www.opqc.net
2017		Range of projections of future opioid deaths	https://www.statnews.com/2017/06/27/opioid-deaths-forecast/
2016		Cuyahoga County Opiate Task Force Report, 2016	
6/25/2018		Summit County Opiate Task Force Meeting	
10/1/2018	Pitt Allison, Humphreys Keith, Brandeau Margaret	Modeling Health Benefits and Harms of Public Policy Responses to the US Opioid Epidemic	American Journal of Public Health
2017	Brooklyn, Johan and Sigmon, Stacey	Vermont Hub-and-Spoke Model of Care For Opioid Use Disorder: Development, Implementation, and Impact	Journal of Addiction Medicine
2018	Hernandez, Yamilette, et al	How Massachusetts, Vermont, and New York are Taking Action to Address the Opioid Epidemic	American Journal of Public Health
		ASAM Patient Placement Criteria	https://www.asam.org/resources/the-asam-criteria/about
Oct. 2, 2018	Emma Sandoe, Carrie E. Fry, Richard G. Frank	Policy Levers That States Can Use To improve Opioid Addiction Treatment And Address The Opioid Epidemic	https://www.healthaffairs.org/doi/10.1377/hblog20180927.51221/full/
Jan. 8, 2013	Carlos Blanco et al.	Probability and predictors of treatment-seeking for prescription opioid use disorders: A National Study	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3636152/
		SAMHSA web site	https://www.samhsa.gov
2018	Barocas, et al.	Estimated Prevalence of Opioid Use Disorder in Massachusetts, 2011-2015: A Capture-Recapture Analysis	American Journal of Public Health

Date	Author	Title	Source
		Ohio Department of Mental Health and Addiction Services, Workforce development as Part of the 21st Century cures Act	
2015	Molfenter Todd, Sherbeck Carol, Zehner Mark, Starr Sandy	Buprenorphine Prescribing Availability in a Sample of Ohio Specialty Treatment Organizations	Journal of Addictive Behaviors, Therapy & Rehabilitation
7/24/2018	Monica, Robbins	Local Health Experts Point to Syringe Exchange Program for drop in HIV cases among drug users	www.wkyc.com
		Why are heroin users special risk contracting HIV Aids - Hepatitis B - C	https://www.drugabuse.gov/publications
		Detailed summaries of evaluation evidence of Life Skill Trainings (LST) AND Project Towards No Drug Abuse (TND)	www.blueprintsprograms.org
9/28/2018	Meisenberg Barry, Grover Jennifer, Campbell Colson, Korpon Daniel	Assessment of Opioid Prescribing Practices Before and After Implementation of a Health System Intervention to Reduce Opioid Overprescribing	JAMA - Open Network
3/25/2011	Henkel	Unemployment and Substance Use: A Review of the Literature (1990-2010)	Current Drug Abuse Reviews, 2011, 4, 4-27
2/1/2017	Boden, Olivia Lee, Horwood, Grest, McLeod	Modelling possible causality in the associations between unemployment, cannabis use, and alcohol misuse	Social Science and Medicine Volume 175
		2017 unemployment rates in Cleveland, Summit and Cuyahoga	https://www.bls.gov/lau/lacilg17.htm
2001	Barnett PG, Zaric GS, Brandeau ML.	The cost-effectiveness of buprenorphine maintenance therapy for opiate addiction in the United States.	Addiction
2014	Cicero TJ, Ellis MS, Surratt HL, Kurtz SP	The changing face of heroin use in the United States: a retrospective analysis of the past 50 years. JAMA Psychiatry. 2014;71(7):821-826.	JAMA Psychiatry

Date	Author	Title	Source
2013	Coffin PO, Sullivan SD	Cost-effectiveness of distributing naloxone to heroin users for lay overdose reversal. Ann Intern Med. 2013;158(1):1-9.	Annals of Internal Medicine
2008	Fishbain DA, Cole B, Lewis J, Rosomoff HL, Rosomoff RS.	What percentage of chronic nonmalignant pain patients exposed to chronic opioid analgesic therapy develop abuse/addiction and/or aberrant drug-related behaviors? A structured evidence-based review. Pain Med. 2008;9(4):444-459.	Pain Medicine
5/20/2016	Goodnough A, Tavernise S	Opioid prescriptions drop for first time in two decades. NY Times. May 20, 2016	New York Times
2017	Hser Y-I, Mooney LJ, Saxon AJ, Miotto K, Bell DS, Huang D	Chronic pain among patients with opioid use disorder: results from electronic health records data. J Subst Abuse Treat. 2017;77:26-30.	Journal of Substance Abuse Treatment
2016	Kochanek KD, SI M, Xu JQ, Tejada-Vera B	Deaths: Final data for 2014. Natl Vital Stat Rep. 2016;65(4):1-122.	National Vital Statistics Report
2013	Muhuri PK, Gfroerer JC, Davies MC	Associations of nonmedical pain reliever use and initiation of heroin use in the United States. Center for Behavioral Health Statistics and Quality Data Review 2013;	http://www.samhsa.gov/data/sites/default/files/DR006/DR006/nonmedical-pain-relieveruse-2013.htm .
2016	Schuckit MA.	Treatment of opioid-use disorders. N Engl J Med. 2016;375(4):357-368.	New England Journal of Medicine
2016	US Census Bureau	Annual estimates of the resident population by single year of age and sex for the United States: April 1, 2010 to July 1, 2015.	https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk
2015	Vowles KE, McEntee ML, Julnes PS, Frohe T, Ney JP, van der Goes DN.	Rates of opioid misuse, abuse, and addiction in chronic pain: a systematic review and data synthesis.	Pain. 2015;156(4):569-576

Date	Author	Title	Source
2016	Xu JQ, Murphy SL, Kochanek KD, Bastian BA	Deaths: final data for 2013.	Natl Vital Stat Rep. 2016;64(2):1-119.
6/13/2018	Margaret Baughman and Mark Singer	Ohio MHAS Addiction Treatment Pilot Program Final Report December 2015	
6/20/2018	Rosalie Liccardo Pacula	Estimating the costs of substitution therapy for heroin and opioid addiction in the United States: Insights and challenges PPT	Rand Drug Policy Research Center - Lisbon Addiction Conference.
7/4/2018	Rachel N. Lipari, Struther L. Can Horn, Arthur Hughes and Matthew Williams	Substance Abuse and Mental Health Services Administration (SAMHSA) - The CBHSQ Report	The CBHSQ Report 7/13/17
7/6/2018	Summit County Opiate Task Force	Summit County Opiate Task Force Quarterly Stakeholder Meeting Presentation	
7/7/2018	Summit County Public Health	Summit County Public Health Strategic Plan: 2017-2019 (Revised January 2018)	
7/8/2018	Ohio Department of Higher Education	Substance Abuse Prevention Education	
7/8/2018	Substance Abuse and Mental Health Services Administration (SAMHSA)	Medications for Opioid Use Disorder for Healthcare and Addiction Professionals, Policymakers, Patients and Families - Treatment Improvement Protocol 63	Substance Abuse and Mental Health Services Administration (SAMHSA) 2018
7/8/2018	Shawn A. Ryan	The Science of Addiction: Overview of Development and Treatment - PPT	

Date	Author	Title	Source
7/9/2018	Harvard Kennedy School, John F. Kennedy School of Government	Epilogue: The Consolidation of the Health Departments in Summit County, Ohio,	
7/9/2018	Ohio State Finance Committee	Testimony of: Dr. Doug Smith, Medical Director/CCO County of Summit ADM Board - June 7, 2017	
12/8/2018	Centers for Disease Control	Guidelines for Prescribing Opioids for Chronic Pain - Pocket Guide: Tapering Opioids for Chronic Pain	Centers for Disease Control
12/8/2018	David Gilchrist, MD, MBA, FAAFP, CPE Assistant Professor in the Dept of Family Medicine and Community Health Umass Memorial Healthcare	Weaning Off Opiates (PPT)	Umass Memorial Healthcare
1/4/2019	Raj Gupta	Find Local Treatment	The Ohio State University Medical Center For the Ohio State Medical Center, Franklin County 11/28/18
1/4/2019	Summit County Public Health	Project Narrative - Summit County Public Health Community Medication Assisted Treatment Program	Summit County Public Health
1/4/2019	Summit County Public Health	Summit County Application for Federal Assistance Summit_001923700	Summit County Public Health
1/5/2019	Department of Health and Human Services Food and Drug Administration Center for Drug Evaluation and Research (CDER)	Opioid Use Disorder: Endpoints for Demonstrating Effectiveness of Drugs for Medication-Assisted Treatment Guidance for Industry	Department of Health and Human Services Food and Drug Administration Center for Drug Evaluation and Research (CDER) August 2018

Date	Author	Title	Source
1/10/2019	National Academies of Sciences, Engineering, and Medicine	Pain Management and the Opioid Epidemic: Balancing Societal and Individual Benefits and Risks of Prescription Opioid Use	National Academies Press. https://doi.org/10.17226/24781
1/12/2019		Ohio Development Services Agency Population Projections: County Totals	
1/12/2019	U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration	National Survey of Substance Abuse Treatment Services (N-SSATS): 2017 Data on Substance Abuse Treatment Facilities	Department of Health And Human Services Substance Abuse and Mental Health Services Administration
3/4/2019	Michele Worobiec, Policy	Chapter 5: Court-Based Responses to the Opioid Crisis	Specialized Dockets Supreme Court of Ohio Columbus, Ohio
3/4/2019	Pathways HUB Community Action	Combating the Opioid Epidemic in Summit County, OH - PPT	Pathways HUB Community Action
3/6/2019	Cuyahoga County Medical Examiner's Office	Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2018 DECEMBER UPDATE January 11, 2019	Cuyahoga County Medical Examiner's Office
3/7/2019	Cuyahoga County Medical Examiner's Office	Cuyahoga County Medical Examiner's Office - Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2019 FEBRUARY UPDATE March 6, 2019	Cuyahoga County Medical Examiner's Office
3/7/2019	Cuyahoga County Medical Examiner's Office	Cuyahoga County Medical Examiner's Office - Heroin/Fentanyl/Cocaine Related Deaths in Cuyahoga County 2019 DRAFT JANUARY UPDATE February 1, 2019	Cuyahoga County Medical Examiner's Office
3/9/2019	Roger E. Backhouse and Jeff Biddle	The Concept of Applied Economics: A History of Ambiguity and Multiple Meanings	https://read.dukeupress.edu/hope/article-pdf/32/Suppl_1/1/427135/01-Biddlebackhouse.pdf

Date	Author	Title	Source
		Alcohol, Drug Addiction & Mental Health Services Board, Report on Opiate Epidemic Impact, November 29, 2018 (SUMMIT_002053751).	
		Deposition Tr. Donna Skoda, August 14, 2018.	
		Deposition Tr. Shane Barker, November 28, 2018.	
		Public Children Services Association of Ohio, Best Interests for Abused and Neglected Children: Working Toward Reunification During the Opioid Crisis, November 15, 2017, http://www.pcsao.org/pdf/advocacy/ReasonableEffortsWhitePaperNov2017.pdf .	
		Public Children Services Association of Ohio, Ohio's Opiate Epidemic and Child Protection: 2016 (SUMMIT_000085306).	
		Public Children Services Association of Ohio, PCSAO Factbook, 12th Edition 2015-2016 (SUMMIT_001874511).	
		Public Children Services Association of Ohio, PCSAO Factbook, 13th Edition 2016-2017 (SUMMIT_001874721).	
		Public Children Services Association of Ohio, PCSAO Factbook, 13th Edition 2016-2017: Summit County (SUMMIT_001874719).	
		Public Children Services Association of Ohio, The Opioid Epidemic's Impact on Children Services in Ohio, December 2018 (SUMMIT_000115686).	
		Public Children Services Association of Ohio, The Opioid Epidemic's Impact on Children Services in Ohio, September 2016 (SUMMIT_000105844).	
		Summit County Alcohol, Drug Addiction & Mental Health Services Board, SUD Services, January 17, 2019.	

Date	Author	Title	Source
		Summit County Alcohol, Drug Addiction & Mental Health Services Board, Summit County Opioid Task Force: Quarterly Stakeholders Meeting, June 25, 2018 (SUMMIT_0011472861).	
		Summit County and City of Akron, Ohio Plaintiff First Amended Responses and Objections to Distributor Defendants' First Set of Interrogatories, June 20, 2018.	
		Summit County Children Services, 2014 Annual Report: Finding Forever Families (SUMMIT_000003930).	
		Summit County Children Services, 2015 Annual Report: Bring Dads into the Picture (SUMMIT_000003942).	
		Summit County Children Services, 2016 Annual Report: The Challenge of Protecting Children During the Opioid Epidemic (SUMMIT_000003954)	
		Summit County Children Services, 2017 Annual Report: Safety, Permanency, Well-Being. That's what we do ... every day (SUMMIT_002052855).	
		Summit County Opiate & Addiction Task Force, 2018 Highlights, December 27, 2018 (SUMMIT_002053857).	
		Summit County Opiate & Addiction Task Force, 2019 Meeting Calendar, December 27, 2018 (SUMMIT_002053885).	
		Summit County Opiate & Addiction Task Force, Public Quarterly Meeting Agenda, December 17, 2018 (SUMMIT_002053822).	
		Summit County Opiate & Addiction Task Force, Public Quarterly Meeting: 4th Quarter – Year End, December 17, 2018 (SUMMIT_002053822).	
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Summit

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Cleveland

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Meeting with Greg Cordek, Cleveland Office Budget and Management, Manager, July 11, 2018.

Table C.0
ODU Population in Year 1, Cuyahoga County

[1]	ODU Rate	1.4%
[2]	Cuyahoga County population 12+, 2017	1,080,868
[3]	ODU population, Year 1	15,213
[4]	% ODU population receiving treatment	20.0%
[5]	ODU population receiving treatment, Year 1	3,043
[6]	MAT % of ODU treatment	33.3%
[7]	ODU population receiving MAT, Year 1	1,014

Sources and Notes:

[1]=0.77% ODU prevalence + 0.63% HUD prevalence. See Pitt AL, Humphreys K, and Brandeau ML (2018), Supplement at S4 and Table A. 0.63% HUD prevalence = 0.51% HUD after ODU prevalence / 80% of HUD individuals with ODU first.

[2]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 or older, Cuyahoga County.

[3]=[1]*[2].

[4], [6]: Based on available data on treatment received by the population with ODU. See e.g., SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2 ("Only 20% with ODU received specialty addiction treatment"); Emma Sandoe, Carrie E. Fry and Richard G. Frank, "Policy Levers That States Can Use to Improve Opioid Addiction Treatment and Address the Opioid Epidemic," Health Affairs, October 2, 2018 ("[F]ewer than 10 percent of those with an ODU receive MAT").

[5]=[3]*[4].

[7]=[5]*[6].

Table S.0
ODU Population in Year 1, Summit County

[1]	ODU Rate	1.4%
[2]	Summit County population 12+, 2017	467,186
[3]	ODU population, Year 1	6,576
[4]	% ODU population receiving treatment	20.0%
[5]	ODU population receiving treatment, Year 1	1,315
[6]	MAT % of ODU treatment	33.3%
[7]	ODU population receiving MAT, Year 1	438

Sources and Notes:

[1]=0.77% ODU prevalence + 0.63% HUD prevalence. See Pitt AL, Humphreys K, and Brandeau ML (2018), Supplement at S4 and Table A. 0.63% HUD prevalence = 0.51% HUD after ODU prevalence / 80% of HUD individuals with ODU first.

[2]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 or older, Summit County.

[3]=[1]*[2].

[4], [6]: Based on available data on treatment received by the population with ODU. See e.g., SAMHSA/HHS: An Update on the Opioid Crisis, March 14, 2018 at p. 2 ("Only 20% with ODU received specialty addiction treatment"); Emma Sandoe, Carrie E. Fry and Richard G. Frank, "Policy Levers That States Can Use to Improve Opioid Addiction Treatment and Address the Opioid Epidemic," Health Affairs, October 2, 2018 ("[F]ewer than 10 percent of those with an ODU receive MAT").

[5]=[3]*[4].

[7]=[5]*[6].

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Table I
Historical and Projected Inflation

	1/2009 to 12/2018 [A]	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Actual inflation:</i>																			
[1] Consumer price index, all items	19.2%	2.1%	1.9%																
[2] Consumer price index, prescription drugs	37.2%	2.8%	(0.6%)																
[3] Consumer price index, medical care services	34.0%	1.6%	2.6%																
[4] Employment cost index, private industry	23.1%	2.6%	3.0%																
[5] Employment cost index, state and local govt	22.7%	2.5%	2.7%																
<i>Projected inflation:</i>																			
[6] Consumer price index, all items				2.1%	2.6%	2.6%	2.5%	2.5%	2.4%	2.3%	2.3%	2.3%	2.3%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
[7] Consumer price index, prescription drugs				4.1%	5.0%	5.0%	4.8%	4.8%	4.6%	4.4%	4.4%	4.4%	4.4%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
[8] Consumer price index, medical care services				3.7%	4.6%	4.6%	4.4%	4.4%	4.2%	4.1%	4.1%	4.1%	4.1%	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
[9] Employment cost index, private industry				3.4%	3.6%	3.6%	3.4%	3.3%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%
[10] Employment cost index, state and local govt				3.3%	3.5%	3.5%	3.3%	3.2%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%

Sources and Notes:

[1]-[5]: Bureau of Labor Statistics. CPI series are for U.S. city average, all urban consumers, seasonally adjusted. ECI series are for total compensation, all industries and occupations.

[6], [9]: Congressional Budget Office, The Budget and Economic Outlook: 2019 to 2029. Table E-1.

[7]=[6]*([2A]/[1A]).

[8]=[6]*([3A]/[1A]).

[10]=[9]*([5A]/[4A]).

APPENDIX D: TREATMENT

Table C.1
Estimated Cost of Treatment, Cuyahoga County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population receiving treatment</i>																
[1]	Population receiving treatment, low case	3,043	4,057	5,071	6,085	6,085	6,085	5,860	5,635	5,409	5,184	4,958	4,733	4,508	4,282	4,057
[2]	Population receiving treatment, base case	3,043	4,057	5,071	6,085	6,085	6,085	6,085	6,085	6,085	6,085	6,085	6,085	6,085	6,085	6,085
[3]	Population receiving treatment, high case	3,043	4,057	5,071	6,085	6,085	6,085	6,311	6,536	6,761	6,987	7,212	7,438	7,663	7,888	8,114
<i>Estimated cost of treatment</i>																
		<i>2019\$ [A]</i>														
[4]	Average cost of treatment provided	\$24,023 / person	\$25,126	\$26,279	\$27,439	\$28,650	\$29,864	\$31,077	\$32,339	\$33,652	\$35,018	\$36,502	\$38,048	\$39,660	\$41,341	\$44,918
<i>Specialized facility for families</i>																
		<i>2019\$ [B]</i>														
[5]	# of residential units required	75														
[6]	Housing cost per unit	\$10,032														
[7]	Childcare cost per unit	\$9,541														
[8]	Resident costs (\$000s)	\$1,468														
[9]	Other operating costs (\$000s)	\$1,165														
[10]	Cost of facility (\$000s)	\$2,633	\$2,702	\$2,772	\$2,841	\$2,912	\$2,982	\$3,051	\$3,121	\$3,193	\$3,266	\$3,345	\$3,425	\$3,507	\$3,591	\$3,678
<i>Total cost of treatment</i>																
		<i>2020-2034 [C]</i>														
[11]	Low case (\$000s)	\$2,602,771	\$79,152	\$109,384	\$141,988	\$177,257	\$184,714	\$192,162	\$192,622	\$192,804	\$192,684	\$192,561	\$192,083	\$191,220	\$189,940	\$188,209
[12]	Base case (\$000s)	\$3,012,354	\$79,152	\$109,384	\$141,988	\$177,257	\$184,714	\$192,162	\$199,911	\$207,973	\$216,361	\$225,468	\$234,960	\$244,852	\$255,162	\$265,907
[13]	High case (\$000s)	\$3,421,938	\$79,152	\$109,384	\$141,988	\$177,257	\$184,714	\$192,162	\$207,199	\$223,142	\$240,038	\$258,375	\$277,837	\$298,484	\$320,384	\$343,604

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: Cost estimated based on Dr. Parran's description of treatment needs (Parran Report at pp. 127, 136-137) and a study of the economic costs of substance abuse treatments (Alexandre PK, Beulaygue IC, French MT et al. (2012)).

[C]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table C.0[5]. Projects that the number of individuals receiving treatment doubles by Year 4. Base case projects the number of individuals receiving treatment remains constant thereafter. Low case projects that the number of individuals receiving treatment will decline by 1/3 from Year 5 to Year 15. High case projects that the number of individuals receiving treatment will increase by 1/3 from Year 5 to Year 15.

[4]: Estimated cost based on [A] and medical care services inflation.

[5]: Double the capacity of Miracle Village, which was a 30-unit apartment building for mothers receiving intensive treatment.

[6]: Based on HUD fair market rent in 2019 for a 2-bedroom residence in Cuyahoga County.

[7]: Average cost of infant childcare in Ohio, as reported by the Economic Policy Institute.

[8]=[5]*([6]+[7])/10^3.

[9]: Based on the (inflation-adjusted) expenditures of Tarry House, a program in Summit County that provided residential recovery/treatment, respite housing, supported housing and community psychiatric and supportive treatment (CPST) and counseling services to nearly 250 different people in 2017.

[10]=[8]+[9]. Year 1 onward grows at inflation.

[11]=([1]*[4])/10^3+[10].

[12]=([2]*[4])/10^3+[10].

[13]=([3]*[4])/10^3+[10].

Table S.1
Estimated Cost of Treatment, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Projected population receiving treatment</i>																
[1]	Population receiving treatment, low case	1,315	1,754	2,192	2,630	2,630	2,630	2,533	2,435	2,338	2,241	2,143	2,046	1,948	1,851	1,754
[2]	Population receiving treatment, base case	1,315	1,754	2,192	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630	2,630
[3]	Population receiving treatment, high case	1,315	1,754	2,192	2,630	2,630	2,630	2,728	2,825	2,923	3,020	3,117	3,215	3,312	3,410	3,507
<i>Estimated cost of treatment</i>																
		<i>2019\$ [A]</i>														
[4]	Average cost of treatment provided	\$24,023 / person	\$25,126	\$26,279	\$27,439	\$28,650	\$29,864	\$31,077	\$32,339	\$33,652	\$35,018	\$36,502	\$38,048	\$39,660	\$41,341	\$44,918
<i>Specialized facility for families</i>																
		<i>2019\$ [B]</i>														
[5]	# of residential units required	30														
[6]	Housing cost per unit	\$9,720														
[7]	Childcare cost per unit	\$9,541														
[8]	Resident costs (\$000s)	\$578														
[9]	Other operating costs (\$000s)	\$1,165														
[10]	Cost of facility (\$000s)	\$1,743	\$1,789	\$1,835	\$1,881	\$1,928	\$1,974	\$2,020	\$2,066	\$2,114	\$2,162	\$2,214	\$2,267	\$2,322	\$2,377	\$2,493
<i>Total cost of treatment</i>																
		<i>2020-2034 [C]</i>														
[11]	Low case (\$000s)	\$1,136,064	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$83,975	\$84,070	\$84,035	\$84,000	\$83,811	\$83,457	\$82,923	\$81,257
[12]	Base case (\$000s)	\$1,313,100	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$87,125	\$90,626	\$94,269	\$98,223	\$102,344	\$106,639	\$111,114	\$120,639
[13]	High case (\$000s)	\$1,490,135	\$34,833	\$47,916	\$62,024	\$77,285	\$80,525	\$83,759	\$90,275	\$97,183	\$104,503	\$112,447	\$120,877	\$129,820	\$139,305	\$160,021

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: Cost estimated based on Dr. Parran's description of treatment needs (Parran Report at pp. 127, 136-137) and a study of the economic costs of substance abuse treatments (Alexandre PK, Beulaygue IC, French MT et al. (2012)).

[C]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table S.0[5]. Projects that the number of individuals receiving treatment doubles by Year 4. Base case projects the number of individuals receiving treatment remains constant thereafter. Low case projects that the number of individuals receiving treatment will decline by 1/3 from Year 5 to Year 15. High case projects that the number of individuals receiving treatment will increase by 1/3 from Year 5 to Year 15.

[4]: Estimated cost based on [A] and medical care services inflation.

[5]: Based on the capacity of Miracle Village, which was a 30-unit apartment building for mothers receiving intensive treatment.

[6]: Based on HUD fair market rent in 2019 for a 2-bedroom residence in Summit County.

[7]: Average cost of infant childcare in Ohio, as reported by the Economic Policy Institute.

[8]=[5]*([6]+[7])/10^3.

[9]: Based on the (inflation-adjusted) expenditures of Tarry House, a program in Summit County that provided residential recovery/treatment, respite housing, supported housing and community psychiatric and supportive treatment (CPST) and counseling services to nearly 250 different people in 2017.

[10]=[8]+[9]. Year 1 onward grows at inflation.

[11]=([1]*[4])/10^3+[10].

[12]=([2]*[4])/10^3+[10].

[13]=([3]*[4])/10^3+[10].

Table C.2
Estimated Cost of MAT, Cuyahoga County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
[1]	MAT % of population receiving treatment	33.3%	44.4%	55.6%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
	<i>Projected population receiving MAT</i>															
[2]	Population receiving MAT, low case	1,014	1,803	2,817	4,057	4,057	4,057	3,907	3,756	3,606	3,456	3,306	3,155	3,005	2,855	2,705
[3]	Population receiving MAT, base case	1,014	1,803	2,817	4,057	4,057	4,057	4,057	4,057	4,057	4,057	4,057	4,057	4,057	4,057	4,057
[4]	Population receiving MAT, high case	1,014	1,803	2,817	4,057	4,057	4,057	4,207	4,357	4,508	4,658	4,808	4,958	5,109	5,259	5,409
	<i>Estimated cost of MAT</i>															
	<i>2019 avg [A]</i>															
[5]	Buprenorphine	\$122 / week	\$6,675	\$7,011	\$7,350	\$7,705	\$8,062	\$8,421	\$8,795	\$9,186	\$9,595	\$10,040	\$10,506	\$10,993	\$11,504	\$12,037
[6]	Methadone	\$134 / week	\$7,314	\$7,681	\$8,053	\$8,442	\$8,833	\$9,226	\$9,637	\$10,065	\$10,513	\$11,000	\$11,511	\$12,045	\$12,604	\$13,189
[7]	Naltrexone (VIVITROL®)	\$1,251 / month	\$15,766	\$16,558	\$17,359	\$18,198	\$19,042	\$19,889	\$20,773	\$21,697	\$22,662	\$11,620	\$11,429	\$10,883	\$11,388	\$11,797
[8]	Average annual cost of MAT		\$7,935	\$8,416	\$8,909	\$9,430	\$9,962	\$10,503	\$10,971	\$11,458	\$11,968	\$10,709	\$11,097	\$11,450	\$11,981	\$12,519
	<i>Allocation of MAT</i>															
	<i>% of MAT [B]</i>															
[9]	Buprenorphine	35.0%	35.0%	36.0%	37.0%	38.0%	39.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
[10]	Methadone	55.0%	55.0%	53.0%	51.0%	49.0%	47.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%
[11]	Naltrexone (VIVITROL®)	10.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
	<i>Total cost of MAT</i>															
	<i>2020-2034 [C]</i>															
[12]	Low case (\$000s)	\$515,155	\$8,048	\$15,175	\$25,099	\$38,256	\$40,414	\$42,611	\$42,857	\$43,042	\$43,157	\$37,009	\$36,681	\$36,129	\$36,005	\$35,741
[13]	Base case (\$000s)	\$595,852	\$8,048	\$15,175	\$25,099	\$38,256	\$40,414	\$42,611	\$44,506	\$46,485	\$48,552	\$43,445	\$45,017	\$46,451	\$48,607	\$50,790
[14]	High case (\$000s)	\$676,550	\$8,048	\$15,175	\$25,099	\$38,256	\$40,414	\$42,611	\$46,154	\$49,928	\$53,947	\$49,882	\$53,354	\$56,774	\$61,209	\$65,839

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: U.S. DOD, Office of the Secretary. 32 CFR Part 199. TRICARE; Mental Health and Substance Use Disorder Treatment. Federal Register, Vol. 81, No. 171, 61068-61098. Adjusted for prescription drug price inflation.

[B]: OhioMHAS estimates that the breakdown of MAT received by clients in Ohio's opioid-treatment programs (OTPs) is 74.2% methadone, 21.5% buprenorphine, and 4.3% naltrexone. This estimate is adjusted to reflect buprenorphine and naltrexone provided via non-OTP treatment facilities, based on data from the National Survey of Substance Abuse Treatment Services, 2017.

[C]=Σ(Year 1 to Year 15).

[1]: Projects that the prevalence of MAT among individuals receiving treatment will double by Year 4 and remain constant thereafter.

[2]=[1]*Table C.1[1].

[3]=[1]*Table C.1[2].

[4]=[1]*Table C.1[3].

[5]-[7]: Annual cost of treatment based on [B] and projected prescription drug price inflation. Naltrexone price drops in 2029 when the drug goes off-patent based on generic pricing trends reported by IMS.

[8]=[5]*[9]+[6]*[10]+[7]*[11].

[9]-[11]: Projects that buprenorphine and naltrexone allocation will increase gradually through Year 6 as the # of PCPs providing MAT increases.

[12]=([2]*[8])/10^3.

[13]=([3]*[8])/10^3.

[14]=([4]*[8])/10^3.

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Table S.2
Estimated Cost of MAT, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
[1]	MAT % of population receiving treatment	33.3%	44.4%	55.6%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%
<i>Projected population receiving MAT</i>																
[2]	Population receiving MAT, low case	438	779	1,218	1,754	1,754	1,754	1,689	1,624	1,559	1,494	1,429	1,364	1,299	1,234	1,169
[3]	Population receiving MAT, base case	438	779	1,218	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754	1,754
[4]	Population receiving MAT, high case	438	779	1,218	1,754	1,754	1,754	1,818	1,883	1,948	2,013	2,078	2,143	2,208	2,273	2,338
<i>Estimated cost of MAT</i>																
		<i>2019 avg [A]</i>														
[5]	Buprenorphine	\$122 / week	\$6,675	\$7,011	\$7,350	\$7,705	\$8,062	\$8,421	\$8,795	\$9,186	\$9,595	\$10,040	\$10,506	\$10,993	\$11,504	\$12,037
[6]	Methadone	\$134 / week	\$7,314	\$7,681	\$8,053	\$8,442	\$8,833	\$9,226	\$9,637	\$10,065	\$10,513	\$11,000	\$11,511	\$12,045	\$12,604	\$13,189
[7]	Naltrexone (VIVITROL®)	\$1,251 / month	\$15,766	\$16,558	\$17,359	\$18,198	\$19,042	\$19,889	\$20,773	\$21,697	\$22,662	\$11,620	\$11,429	\$10,883	\$11,388	\$11,797
[8]	Average annual cost of MAT		\$7,935	\$8,416	\$8,909	\$9,430	\$9,962	\$10,503	\$10,971	\$11,458	\$11,968	\$10,709	\$11,097	\$11,450	\$11,981	\$12,519
<i>Allocation of MAT</i>		<i>% of MAT [B]</i>														
[9]	Buprenorphine	35.0%	35.0%	36.0%	37.0%	38.0%	39.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
[10]	Methadone	55.0%	55.0%	53.0%	51.0%	49.0%	47.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%	45.0%
[11]	Naltrexone (VIVITROL®)	10.0%	10.0%	11.0%	12.0%	13.0%	14.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
<i>Total cost of MAT</i>		<i>2020-2034 [C]</i>														
[12]	Low case (\$000s)	\$222,667	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$18,524	\$18,604	\$18,654	\$15,997	\$15,855	\$15,616	\$15,563	\$15,448
[13]	Base case (\$000s)	\$257,547	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$19,237	\$20,092	\$20,986	\$18,779	\$19,458	\$20,078	\$21,009	\$21,953
[14]	High case (\$000s)	\$292,427	\$3,479	\$6,559	\$10,849	\$16,535	\$17,468	\$18,418	\$19,949	\$21,581	\$23,318	\$21,561	\$23,061	\$24,540	\$26,456	\$30,196

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: U.S. DOD, Office of the Secretary. 32 CFR Part 199. TRICARE; Mental Health and Substance Use Disorder Treatment. Federal Register, Vol. 81, No. 171, 61068-61098. Adjusted for prescription drug price inflation.

[B]: OhioMHAS estimates that the breakdown of MAT received by clients in Ohio's opioid-treatment programs (OTPs) is 74.2% methadone, 21.5% buprenorphine, and 4.3% naltrexone. This estimate is adjusted to reflect buprenorphine and naltrexone provided via non-OTP treatment facilities, based on data from the National Survey of Substance Abuse Treatment Services, 2017.

[C]=Σ(Year 1 to Year 15).

[1]: Projects that the prevalence of MAT among individuals receiving treatment will double by Year 4 and remain constant thereafter.

[2]=[1]*Table S.1[1].

[3]=[1]*Table S.1[2].

[4]=[1]*Table S.1[3].

[5]-[7]: Annual cost of treatment based on [B] and projected prescription drug price inflation. Naltrexone price drops in 2029 when the drug goes off-patent based on generic pricing trends reported by IMS.

[8]=[5]*[9]+[6]*[10]+[7]*[11].

[9]-[11]: Projects that buprenorphine and naltrexone allocation will increase gradually through Year 6 as the # of PCPs providing MAT increases.

[12]=([2]*[8])/10^3.

[13]=([3]*[8])/10^3.

[14]=([4]*[8])/10^3.

Table C.3
Estimated Cost of Recruiting PCPS to Provide MAT, Cuyahoga County

			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Recruitment staffing requirements</i>			<i>2019 [A]</i>														
[1]	FTEs to recruit PCPs to provide MAT	4															
[2]	FTE salary estimate	\$66,000															
[3]	Salary cost (\$000s)	\$264	\$273	\$283	\$293	\$302	\$312	\$321	\$331	\$341	\$351	\$362	\$373	\$384	\$396	\$408	\$421
<i>Labor Cost</i>																	
<i>Estimated employment cost</i>			<i>Multiplier [B]</i>														
[4]	FTE employment cost, base case (\$000s)	1.75x	\$478	\$495	\$512	\$529	\$545	\$562	\$579	\$597	\$615	\$634	\$653	\$673	\$693	\$714	\$736
<i>Total cost of recruitment</i>			<i>2020-2034 [C]</i>														
[5]	Base case (\$000s)	\$9,014	\$478	\$495	\$512	\$529	\$545	\$562	\$579	\$597	\$615	\$634	\$653	\$673	\$693	\$714	\$736

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

Table S.3
Estimated Cost of Recruiting PCPS to Provide MAT, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Recruitment staffing requirements</i> <i>2019 [A]</i>																
[1]	FTEs to recruit PCPs to provide MAT	2														
[2]	FTE salary estimate	\$66,000														
[3]	Salary cost (\$000s)	\$132	\$137	\$142	\$146	\$151	\$156	\$161	\$165	\$170	\$176	\$181	\$187	\$192	\$198	\$204
<i>Labor Cost</i>																
<i>Estimated employment cost</i> <i>Multiplier [B]</i>																
[4]	FTE employment cost, base case (\$000s)	1.75x	\$239	\$248	\$256	\$264	\$273	\$281	\$289	\$298	\$307	\$317	\$326	\$336	\$347	\$357
<i>Total cost of recruitment</i> <i>2020-2034 [C]</i>																
[5]	Base case (\$000s)	\$4,507	\$239	\$248	\$256	\$264	\$273	\$281	\$289	\$298	\$307	\$317	\$326	\$336	\$347	\$357

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[C]=Σ(Year 1 to Year 15).

[2]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]=[4].

APPENDIX D: HARM REDUCTION

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Table C.8
Estimated Cost of Naloxone, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Projected population requiring Narcan kits</i>																
[1]	Population requiring Narcan kits, low case	15,213	15,105	14,996	14,887	14,779	14,670	14,561	14,453	14,344	14,235	14,127	14,018	13,909	13,801	13,692
[2]	Population requiring Narcan kits, base case	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213	15,213
[3]	Population requiring Narcan kits, high case	15,213	15,322	15,431	15,539	15,648	15,757	15,865	15,974	16,083	16,191	16,300	16,409	16,517	16,626	16,735
<i>Estimated cost of Narcan kits</i>																
		<i>2019 [A]</i>														
[4]	Wholesale price \$111 / kit	\$113	\$116	\$119	\$122	\$125	\$128	\$131	\$134	\$137	\$140	\$144	\$147	\$151	\$154	\$158
[5]	Average # per person per year	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
[6]	Average cost per person per year	\$113	\$233	\$239	\$245	\$250	\$256	\$262	\$268	\$274	\$281	\$288	\$295	\$302	\$309	\$316
<i>Salary cost of distributing kits</i>																
		<i>2019 [B]</i>														
[7]	Distribution program administrators 2															
[8]	Estimated FTE salary \$55,500															
[9]	Salary cost (\$000)	\$111	\$115	\$119	\$123	\$127	\$131	\$135	\$139	\$143	\$148	\$152	\$157	\$162	\$167	\$172
<i>Labor Cost</i>																
		<i>Multiplier [C]</i>														
[10]	FTE employment cost, base case (\$000s) 1.75x	\$201	\$208	\$215	\$222	\$229	\$236	\$243	\$251	\$258	\$266	\$274	\$283	\$291	\$300	\$310
<i>Total cost of Narcan kits</i>																
		<i>2020-2034 [D]</i>														
[11]	Low case (\$000s)	\$60,319	\$1,927	\$3,725	\$3,794	\$3,864	\$3,931	\$3,995	\$4,060	\$4,126	\$4,193	\$4,265	\$4,338	\$4,412	\$4,487	\$4,563
[12]	Base case (\$000s)	\$63,587	\$1,927	\$3,750	\$3,846	\$3,943	\$4,040	\$4,134	\$4,231	\$4,330	\$4,432	\$4,540	\$4,650	\$4,764	\$4,880	\$4,999
[13]	High case (\$000s)	\$66,856	\$1,927	\$3,775	\$3,897	\$4,023	\$4,149	\$4,273	\$4,402	\$4,534	\$4,670	\$4,815	\$4,963	\$5,116	\$5,273	\$5,435
<i>Naloxone for first responders</i>																
		<i>2019 [E]</i>														
[14]	Average price per dose \$43 / dose	\$46	\$48	\$50	\$53	\$55	\$57	\$60	\$63	\$66	\$69	\$72	\$75	\$79	\$82	\$86
[15]	Naloxone purchased 12,082 doses															
[16]	Cost of Naloxone purchased \$524,283															
[17]	Naloxone doses purchased for first responders, low case	12,082	10,572	9,062	7,551	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041	6,041
[18]	Naloxone doses purchased for first responders, base case	12,082	11,327	10,572	9,817	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062	9,062
[19]	Naloxone doses purchased for first responders, high case	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082	12,082
<i>Total cost for first responders</i>																
		<i>2020-2034 [F]</i>														
[20]	Low case (\$000s)	\$6,517	\$551	\$506	\$455	\$397	\$333	\$347	\$363	\$379	\$396	\$414	\$433	\$453	\$474	\$496
[21]	Base case (\$000s)	\$9,053	\$551	\$542	\$530	\$516	\$499	\$521	\$544	\$568	\$594	\$621	\$650	\$680	\$712	\$745
[22]	High case (\$000s)	\$11,588	\$551	\$578	\$606	\$636	\$665	\$695	\$726	\$758	\$791	\$828	\$867	\$907	\$949	\$993

Table C.8
Estimated Cost of Naloxone, Cuyahoga County

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D],[F]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table C.0[6]. Base case projects that the population requiring Narcan kits remains constant, high case projects that it increases by 10%, and low case projects that it decreases by 10%.

[4]: [4A] estimated based on the wholesale price for Narcan nasal spray kit (containing 2 doses) paid by Cleveland EMS in October and November of 2017. CLEVE_001627553. Year 1 onwards grows at prescription drug price inflation.

[5]: Projects the distribution of one kit per person requiring Narcan kits in Year 1, increasing to two kits distributed per individual by Year 2.

[6]=[4]*[5].

[8]: Salary estimated based on Cuyahoga County salary data for comparable employee types. CUYAH_002426286.

[9]: [9B]=([7]*[8])/10³. Year 1 onwards grown at projected employment cost inflation.

[10]=[9]*[C].

[11]=([1]*[6])/10³+ [10].

[12]=([2]*[6])/10³+ [10].

[13]=([3]*[6])/10³+ [10].

[14]: [E14] estimated based on the actual average price per dose of Naloxone purchased by Cleveland EMS in 2017. CLEVE_001627553. Year 1 onwards grows at prescription drug price inflation.

[15]: Based on the actual number of doses purchased by Cleveland EMS in 2017. CLEVE_001627553.

[16]=[14]*[15].

[17]-[19]: Year 1 from [15]. High case projects that the doses purchased for first responders remains constant, base case projects a 25% decline by Year 5, and low case projects a 50% decline by Year 5.

[20]=([17]*[14])/10³.

[21]=([18]*[14])/10³.

[22]=([19]*[14])/10³.

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Table S.8
Estimated Cost of Naloxone, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Projected population requiring Narcan kits</i>																
[1]	Population requiring Narcan kits, low case	6,576	6,529	6,482	6,435	6,388	6,341	6,294	6,247	6,200	6,153	6,106	6,059	6,012	5,965	5,918
[2]	Population requiring Narcan kits, base case	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576	6,576
[3]	Population requiring Narcan kits, high case	6,576	6,623	6,670	6,717	6,764	6,810	6,857	6,904	6,951	6,998	7,045	7,092	7,139	7,186	7,233
<i>Estimated cost of Narcan kits</i>																
		<i>2019 [A]</i>														
[4]	Wholesale price \$111 / kit	\$113	\$116	\$119	\$122	\$125	\$128	\$131	\$134	\$137	\$140	\$144	\$147	\$151	\$154	\$158
[5]	Average # per person per year	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
[6]	Average cost per person per year	\$113	\$233	\$239	\$245	\$250	\$256	\$262	\$268	\$274	\$281	\$288	\$295	\$302	\$309	\$316
<i>Salary cost of distributing kits</i>																
		<i>2019 [B]</i>														
[7]	Distribution program administrators 2															
[8]	Estimated FTE salary \$55,500															
[9]	Salary cost (\$000)	\$115	\$119	\$123	\$127	\$131	\$135	\$139	\$143	\$148	\$152	\$157	\$162	\$167	\$172	\$177
<i>Labor Cost</i>																
		<i>Estimated employment cost Multiplier [C]</i>														
[10]	FTE employment cost, base case (\$000s) 1.75x	\$201	\$208	\$215	\$222	\$229	\$236	\$243	\$251	\$258	\$266	\$274	\$283	\$291	\$300	\$310
<i>Total cost of Narcan kits</i>		<i>2020-2034 [D]</i>														
[11]	Low case (\$000s)	\$28,224	\$947	\$1,728	\$1,762	\$1,796	\$1,829	\$1,861	\$1,893	\$1,926	\$1,959	\$1,995	\$2,031	\$2,068	\$2,105	\$2,143
[12]	Base case (\$000s)	\$29,636	\$947	\$1,739	\$1,784	\$1,831	\$1,876	\$1,921	\$1,967	\$2,014	\$2,062	\$2,113	\$2,166	\$2,220	\$2,275	\$2,331
[13]	High case (\$000s)	\$31,049	\$947	\$1,750	\$1,807	\$1,865	\$1,923	\$1,981	\$2,041	\$2,102	\$2,165	\$2,232	\$2,301	\$2,372	\$2,445	\$2,520
<i>Naloxone for first responders</i>																
		<i>2019 [E]</i>														
[14]	Average price per dose \$43 / dose	\$46	\$48	\$50	\$53	\$55	\$57	\$60	\$63	\$66	\$69	\$72	\$75	\$79	\$82	\$86
[15]	Naloxone purchased 5,222 doses															
[16]	Cost of Naloxone purchased \$226,612															
[17]	Naloxone doses purchased for first responders, low case	5,222	4,569	3,917	3,264	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611
[18]	Naloxone doses purchased for first responders, base case	5,222	4,896	4,569	4,243	3,917	3,917	3,917	3,917	3,917	3,917	3,917	3,917	3,917	3,917	3,917
[19]	Naloxone doses purchased for first responders, high case	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222	5,222
<i>Total cost for first responders</i>		<i>2020-2034 [F]</i>														
[20]	Low case (\$000s)	\$2,817	\$238	\$219	\$197	\$172	\$144	\$150	\$157	\$164	\$171	\$179	\$187	\$196	\$205	\$215
[21]	Base case (\$000s)	\$3,913	\$238	\$234	\$229	\$223	\$216	\$225	\$235	\$246	\$257	\$268	\$281	\$294	\$308	\$322
[22]	High case (\$000s)	\$5,009	\$238	\$250	\$262	\$275	\$287	\$300	\$314	\$328	\$342	\$358	\$375	\$392	\$410	\$429

Table S.8
Estimated Cost of Naloxone, Summit County

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D],[F]=Σ(Year 1 to Year 15).

[1]-[3]: Year 1 from Table S.0[6]. Base case projects that the population requiring Narcan kits remains constant, high case projects that it increases by 10%, and low case projects that it decreases by 10%.

[4]=Table C.8[4].

[5]: Projects the distribution of one kit per person requiring Narcan kits in Year 1, increasing to two kits distributed per individual by Year 2.

[6]=[4]*[5].

[8]=Table C.8[8].

[9]: [9B]=([7]*[8])/10³. Year 1 onwards grown at projected employment cost inflation.

[10]=[9]*[C].

[11]=([1]*[6])/10³+ [10].

[12]=([2]*[6])/10³+ [10].

[13]=([3]*[6])/10³+ [10].

[14]=Table C.8[14].

[15]=Table C.8[15]*(Table S.0[2]/Table C.0[2]).

[16]=[14]*[15].

[17]-[19]: Year 1 from [15]. High case projects that the doses purchased for first responders remains constant, base case projects a 25% decline by Year 5, and low case projects a 50% decline by Year 5.

[20]=([17]*[14])/10³.

[21]=([18]*[14])/10³.

[22]=([19]*[14])/10³.

Table C.9
Estimated Cost of Syringe Exchange Program, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	<i>2019 [A]</i>															
[1]	Monthly average # of syringes provided	41,250														
[2]	OOD % of program clients	67.4%														
[3]	Monthly avg # of syringes provided to OUD individ.	27,787														
	<i># of syringes to provide</i>															
[4]	Syringes provided per month, low case	34,734	41,680	41,680	41,680	41,680	41,264	40,847	40,430	40,013	39,596	39,180	38,763	38,346	37,929	37,512
[5]	Syringes provided per month, base case	34,734	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680	41,680
[6]	Syringes provided per month, high case	34,734	41,680	41,680	41,680	41,680	42,097	42,514	42,931	43,348	43,764	44,181	44,598	45,015	45,432	45,848
	<i>Cost of exchange program per syringe</i>	<i>2019 [B]</i>														
[7]	Program cost per syringe distributed	\$1.25	\$1.28	\$1.32	\$1.35	\$1.38	\$1.42	\$1.45	\$1.48	\$1.52	\$1.55	\$1.59	\$1.63	\$1.66	\$1.70	\$1.75
	<i>Total cost of exchange program</i>	<i>2020-2034 [C]</i>														
[8]	Low case (\$000s)	\$10,867	\$535	\$658	\$675	\$691	\$708	\$717	\$726	\$735	\$744	\$754	\$764	\$774	\$784	\$795
[9]	Base case (\$000s)	\$11,325	\$535	\$658	\$675	\$691	\$708	\$724	\$741	\$758	\$775	\$794	\$813	\$833	\$853	\$873
[10]	High case (\$000s)	\$11,784	\$535	\$658	\$675	\$691	\$708	\$732	\$756	\$781	\$806	\$834	\$862	\$891	\$921	\$952

Table C.9

Estimated Cost of Syringe Exchange Program, Cuyahoga County

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]=Σ(Year 1 to Year 15).

[1]: Equal to the average # of syringes distributed in the year ended June 30, 2016. Circle Health Services, Form 990 for the year ended June 30, 2016 at 44.

[2]=Table S.9[2].

[3]=[1]*[2].

[4]-[6]: All cases assume the number of syringes provided to individuals with OUD increases by 50% by Year 2. Base case assumes the number of syringes provided to individuals with OUD remains constant after Year 2, low case assumes a decline of 10%, and high case assumes an increase of 10%.

[7]: Cost based on the operating costs reported by Cleveland's Circle Health Services (Form 990 for the year ended June 30, 2016 at p. 44) and a study reporting the average cost per syringe distributed in exchange programs (Lurie P, Gorsky R, Jones TS et al. (1998)). Year 1 onwards grows at inflation.

[8]=([4]*12*[7])/10^3.

[9]=([5]*12*[7])/10^3.

[10]=([6]*12*[7])/10^3.

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Table S.9
Estimated Cost of Syringe Exchange Program, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>2019 [A]</i>																
[1]	Monthly average # of syringes provided	24,225															
[2]	OUD % of program clients	67.4%															
[3]	Monthly avg # of syringes provided to OUD individ.	16,318															
	<i># of syringes to provide</i>																
[4]	Syringes provided per month, low case	21,758	27,197	27,197	27,197	27,197	26,925	26,654	26,382	26,110	25,838	25,566	25,294	25,022	24,750	24,478	
[5]	Syringes provided per month, base case	21,758	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	27,197	
[6]	Syringes provided per month, high case	21,758	27,197	27,197	27,197	27,197	27,469	27,741	28,013	28,285	28,557	28,829	29,101	29,373	29,645	29,917	
	<i>Cost of exchange program per syringe</i>	<i>2019 [B]</i>															
[7]	Program cost per syringe distributed	\$1.25	\$1.28	\$1.32	\$1.35	\$1.38	\$1.42	\$1.45	\$1.48	\$1.52	\$1.55	\$1.59	\$1.63	\$1.66	\$1.70	\$1.75	\$1.79
	<i>Total cost of exchange program</i>	<i>2020-2034 [C]</i>															
[8]	Low case (\$000s)	\$7,077	\$335	\$429	\$440	\$451	\$462	\$468	\$474	\$480	\$486	\$492	\$499	\$505	\$512	\$518	\$525
[9]	Base case (\$000s)	\$7,376	\$335	\$429	\$440	\$451	\$462	\$473	\$484	\$495	\$506	\$518	\$531	\$543	\$556	\$570	\$583
[10]	High case (\$000s)	\$7,675	\$335	\$429	\$440	\$451	\$462	\$477	\$493	\$509	\$526	\$544	\$562	\$581	\$601	\$621	\$642

Table S.9
Estimated Cost of Syringe Exchange Program, Summit County

Sources and Notes:

See Table I for actual and projected inflation rates used.

[C]=Σ(Year 1 to Year 15).

[1]: Actual monthly average # of syringes distributed in January and February 2019. (<https://www.scph.org/dashboards>)

[2]: Based on the % of clients of the Summit County syringe exchange program reporting heroin, fentanyl or opioid use in January-February 2019.

[3]=[1]*[2].

[4]-[6]: All cases assume the number of syringes provided to individuals with OUD increases by ~66% by Year 2. Base case assumes the number of syringes provided to individuals with OUD remains constant after Year 2, low case assumes a decline of 10% beginning in Year 6, and high case assumes an increase of 10% beginning in Year 6.

[7]: Cost based on the operating costs reported by Cleveland's Circle Health Services (Form 990 for the year ended June 30, 2016 at p. 44) and a study reporting the average cost per syringe distributed in exchange programs (Lurie P, Gorsky R, Jones TS et al. (1998)). Year 1 onwards grows at inflation.

[8]=([4]*12*[7])/10^3.

[9]=([5]*12*[7])/10^3.

[10]=([6]*12*[7])/10^3.

APPENDIX D: PRIMARY PREVENTION

Table C.12
Estimated Cost of Media Campaign, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Target population for campaign</i>	<i>July 1, 2017 [A]</i>															
[1]	12-25 year old population	220,086	220,086	219,371	218,658	217,947	217,239	216,533	215,829	215,128	214,429	213,732	213,037	212,345	211,655	210,967	210,281
	<i>Estimated cost of campaign</i>	<i>2019 Avg [B]</i>															
[2]	Per targeted individual	\$0.40 / month	\$0.41	\$0.42	\$0.44	\$0.45	\$0.46	\$0.47	\$0.48	\$0.49	\$0.50	\$0.51	\$0.53	\$0.54	\$0.55	\$0.56	\$0.58
[3]	# of months of campaign will run	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
[4]	Estimated cost per target per year	\$2.49	\$5.10	\$5.23	\$5.36	\$5.49	\$5.61	\$5.74	\$5.87	\$6.01	\$6.15	\$6.30	\$6.45	\$6.61	\$6.77	\$6.93	
	<i>Total cost of campaign</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$18,485	\$547	\$1,119	\$1,143	\$1,168	\$1,192	\$1,215	\$1,239	\$1,264	\$1,288	\$1,315	\$1,342	\$1,370	\$1,398	\$1,427	\$1,457

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 to 25 years old, Cuyahoga County.

[C]=Σ(Year 1 to Year 15).

[1]: Target audience based on Georgia's "Generation Rx" campaign, which aims to prevent the misuse/abuse of prescription drugs among 12-25 year olds. Growth after Year 1 projected based on county population projections published by the Ohio Development Services Agency.

[2]: [2B] estimated based on the FDA's "The Real Cost" anti-smoking campaign. Mac Monegle et al (2018). Year 1 onwards grows at inflation.

[3]: Projects that media campaign will be launched by second half of Year 1.

[4]=[2]*[3].

[5]=([1]*[4])/10^3.

Table S.12
Estimated Cost of Media Campaign, Summit County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
	<i>Target population for campaign</i>	<i>July 1, 2017 [A]</i>															
[1]	12-25 year old population	94,300	94,300	94,248	94,196	94,144	94,092	94,040	93,988	93,936	93,884	93,832	93,780	93,728	93,676	93,624	93,572
	<i>Estimated cost of campaign</i>	<i>2019 Avg [B]</i>															
[2]	Per targeted individual	\$0.40 / month	\$0.41	\$0.42	\$0.44	\$0.45	\$0.46	\$0.47	\$0.48	\$0.49	\$0.50	\$0.51	\$0.53	\$0.54	\$0.55	\$0.56	\$0.58
[3]	# of months of campaign will run	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
[4]	Estimated cost per target per year	\$2.49	\$5.10	\$5.23	\$5.36	\$5.49	\$5.61	\$5.74	\$5.87	\$6.01	\$6.15	\$6.30	\$6.45	\$6.61	\$6.77	\$6.93	
	<i>Total cost of campaign</i>	<i>2020-2034 [C]</i>															
[5]	Base case (\$000s)	\$8,085	\$234	\$481	\$492	\$504	\$516	\$528	\$540	\$552	\$564	\$577	\$591	\$605	\$619	\$633	\$648

Sources and Notes:

See Table I for actual and projected inflation rates used.

[A]: National Center for Health Statistics, Bridged-Race Population Estimates, July 1st resident population age 12 to 25 years old, Summit County.

[C]=Σ(Year 1 to Year 15).

[1]: Target audience based on Georgia's "Generation Rx" campaign, which aims to prevent the misuse/abuse of prescription drugs among 12-25 year olds. Growth after Year 1 projected based on county population projections published by the Ohio Development Services Agency.

[2]: [2B] estimated based on the FDA's "The Real Cost" anti-smoking campaign. Mac Monegle et al (2018). Year 1 onwards grows at inflation.

[3]: Projects that media campaign will be launched by second half of Year 1.

[4]=[2]*[3].

[5]=([1]*[4])/10^3.

Table C.13
Estimated Cost of School-Based Prevention, Cuyahoga County

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
<i>Salary cost of personnel</i>		<i>2019 [A]</i>														
[1]	# of social workers required to help students affected by opioid crisis	106														
[2]	FTE salary estimate	\$45,000														
[3]	Salary cost (\$000s)	\$4,770	\$4,939	\$5,114	\$5,285	\$5,457	\$5,628	\$5,800	\$5,977	\$6,159	\$6,347	\$6,541	\$6,740	\$6,946	\$7,158	\$7,376
		<i>Labor Cost</i>														
<i>Estimated employment cost</i>		<i>Multiplier [B]</i>														
[4]	FTE employment cost, base case (\$000s)	1.75x	\$8,643	\$8,949	\$9,249	\$9,549	\$9,850	\$10,150	\$10,460	\$10,779	\$11,108	\$11,447	\$11,796	\$12,156	\$12,526	\$12,908
<i>Estimated cost of curriculum</i>		<i>2019 [C]</i>														
[5]	Cost of prevention curriculum per pupil	\$52														
[6]	# of students, grades 6-12	106,380														
[7]	Cost of prevention curriculum (\$000s)	\$5,532	\$5,676	\$5,823	\$5,969	\$6,118	\$6,265	\$6,409	\$6,556	\$6,707	\$6,861	\$7,026	\$7,195	\$7,367	\$7,544	\$7,725
<i>Estimated total cost</i>		<i>2020-2034 [D]</i>														
[8]	Base case (\$000s)	\$264,023	\$14,319	\$14,773	\$15,218	\$15,667	\$16,115	\$16,559	\$17,016	\$17,486	\$17,969	\$18,473	\$18,990	\$19,523	\$20,070	\$20,634

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[1]: Estimated based on public and private school enrollment data from the National Center for Education Statistics and the assumption that approximately 25% of students have more intensive needs due to the opioid crisis. The recommended student-social worker ratio is lower for students with intensive needs. National Association of Social Workers, Standards for School Social Work Services (2012) at p.18: "School social work services should be provided at a ratio of one school social worker to each school building serving up to 250 general education students, or a ratio of 1:250 students. When a school social worker is providing services to students with intensive needs, a lower ratio, such as 1:50, is suggested."

[2]: Salary estimated based on the salary range for school counselors in the Cleveland area reported by Glassdoor.

[3]: [3A]=[1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]: Estimate based on SAMSHA/HHS study, which found that Youth Substance Abuse Prevention Programs cost on average \$52/pupil for materials and training. SAMSHA/HHS, "Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis," Table A4: Estimated Program Costs by Component (in 2002 dollars).

[6]: Public and private school enrollment data from the National Center for Education Statistics.

[7]: [7C]=[5]*[6])/10^3. Year 1 onwards grown at projected inflation.

[8]=[4]+[7].

Table S.13
Estimated Cost of School-Based Prevention, Summit County

		Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024	Year 6 2025	Year 7 2026	Year 8 2027	Year 9 2028	Year 10 2029	Year 11 2030	Year 12 2031	Year 13 2032	Year 14 2033	Year 15 2034
<i>Salary cost of personnel</i>																
	<i>2019 [A]</i>															
[1]	# of social workers required to help students affected by opioid crisis	46														
[2]	FTE salary estimate	\$45,000														
[3]	Salary cost (\$000s)	\$2,070	\$2,143	\$2,219	\$2,293	\$2,368	\$2,443	\$2,517	\$2,594	\$2,673	\$2,754	\$2,839	\$2,925	\$3,014	\$3,106	\$3,201
<i>Labor Cost</i>																
	<i>Estimated employment cost</i>															
	<i>Multiplier [B]</i>															
[4]	FTE employment cost, base case (\$000s)	1.75x	\$3,751	\$3,884	\$4,014	\$4,144	\$4,274	\$4,405	\$4,539	\$4,678	\$4,820	\$4,967	\$5,119	\$5,275	\$5,436	\$5,602
<i>Estimated cost of curriculum</i>																
	<i>2019 [C]</i>															
[5]	Cost of prevention curriculum per pupil	\$52														
[6]	# of students, grades 6-12	45,599														
[7]	Cost of prevention curriculum (\$000s)	\$2,371	\$2,433	\$2,496	\$2,558	\$2,622	\$2,685	\$2,747	\$2,810	\$2,875	\$2,941	\$3,012	\$3,084	\$3,158	\$3,234	\$3,311
<i>Estimated total cost</i>																
	<i>2020-2034 [D]</i>															
[8]	Base case (\$000s)	\$114,038	\$6,184	\$6,380	\$6,572	\$6,766	\$6,960	\$7,152	\$7,349	\$7,553	\$7,761	\$7,979	\$8,203	\$8,433	\$8,670	\$9,163

Sources and Notes:

See Table I for actual and projected inflation rates used.

[B]: Multiplier intended to capture labor costs beyond salary, such as fringe benefits and office costs.

[D]=Σ(Year 1 to Year 15).

[1]: Estimated based on public and private school enrollment data from the National Center for Education Statistics and the assumption that approximately 25% of students have more intensive needs due to the opioid crisis. The recommended student-social worker ratio is lower for students with intensive needs. National Association of Social Workers, Standards for School Social Work Services (2012) at p.18: "School social work services should be provided at a ratio of one school social worker to each school building serving up to 250 general education students, or a ratio of 1:250 students. When a school social worker is providing services to students with intensive needs, a lower ratio, such as 1:50, is suggested."

[2]: Salary estimated based on the salary range for school counselors in the Akron area reported by Glassdoor.

[3]: [3A]=([1]*[2])/10^3. Year 1 onwards grown at projected employment cost inflation.

[4]=[3]*[B].

[5]: Estimate based on SAMSHA/HHS study, which found that Youth Substance Abuse Prevention Programs cost on average \$52/pupil for materials and training. SAMSHA/HHS, "Substance Abuse Prevention Dollars and Cents: A Cost-Benefit Analysis," Table A4: Estimated Program Costs by Component (in 2002 dollars).

[6]: Public and private school enrollment data from the National Center for Education Statistics.

[7]: [7C]=([5]*[6])/10^3. Year 1 onwards grown at projected inflation.

[8]=[4]+[7].